JANUARY, 1954

AMERICAN FOUNDRYMAN

American

men's OWN Ma

Vol. 25, No. 1

"THE CO-OPERATION WAS TERRIFIC!"

...Ingersoll Products Division
Borg-Warner Corporation,
Chicago

Twin Lectromelt Furnaces at Ingersoll Products Division of the Borg-Warner Corporation.

One of Ingersoll's new 18-ton Lectromelt Furnaces pours its first heat.

Lectromelt people, electrical equipment suppliers and the power company teamed up for fast action . . .

"The first of these two furnaces was installed in the fastest time I've ever seen . . . three weeks from foundation rack until we turned on the power for melting our first charge." These are comments of Neal Ruisard, Ingersoll's Chief Electrical Engineer.

To put in a new furnace or replace an old one and get into production fast, you'll need maximum help from your furnace builder. Lectromelt helps you minimize lost time (lost money) at installation. Every Lectromelt* Furnace is fully assembled on the Lectromelt factory floor. It's right before it's shipped! Then Lectromelt men come to your plant to help get your new furnace into action fast.

Write for Catalog No. 9 giving complete data on Lectromelt Furnaces. Request engineering or service information. Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*

HERE'S ALL YOU NEED

These three additives will provide the precise sand characteristics needed for your work. FEDERAL GREEN BOND for desired sand strength. CROWN HILL SEACOAL for carbon content. FEDERAL SAND STABILIZER for flowability. And of the three, FEDERAL STABILIZER can be the one factor to really "balance out" your sand for better results. FEDERAL STABILIZER definitely provides better flowability so green strength can be run higher—makes for easier, more uniform ramming—allows a wider range of safe moisture content—minimizes lumpy shakeout to permit maximum sand reclamation.

HERE'S GOOD NEWS! You now have a choice of "DUSTLESS" or "regular" CROWN HILL SEACOAL and FEDERAL PITCH BINDERS. The new "dustless" type is chemically treated to minimize dustiness in handling. This treatment in no way affects the performance of any sand additives. The difference is in handling—working conditions are greatly improved through the reduction of skin irritation and dust inhalation. The slight additional cost is more than offset by more healthful working conditions, better "housekeeping" and the elimination of losses in air-swept mixing and handling equipment. Ask your FEDERAL representative to show you the convincing demonstration of "dustless" additives.

Make your foundry a better place in which to work!

FEDERAL

The FEDERAL FOUNDRY SUPPLY Company

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CROWN HILL W. VA. • CHICAGO • DETROIT • MILWAUKEE • RICHMOND VA. • ST. LOUIS • CHATTANOOGA • NEW YORK • UPTON WYO.

WHICH FOUNDRY POURS MORE METAL?

300 molds on their way to the shake-out at Otis Elevator, Yonkers, N. Y. MODERN cranes, monorail, pouring devices and ladles are synchronized for fast, high-production pouring.

Model "E" Pouring Devices, 14" covered, tapered ladles, 19" distributing ladle and four, trolley type cranes pour 8 tons of gray iron, per hour, at Barclay Foundry, Milwaukee. Castings are supplied to machine tool builders and auto manufacturers.

Both Foundries are MODERN EQUIPPED!

and on a man-per-hour basis both foundries are pouring approximately the same volume of metal.

At the large Otis Elevator foundry, Yonkers, New York the MODERN Pouring Devices operate on MODERN trolley type cranes. Molds, when poured, move on roller conveyors to the shake-out.

At the smaller, Barclay Foundry, Milwaukee, two tons of metal, per man hour are poured with each Pouring Device.

Both foundries are saving the MODERN way — SAVING time . . . SAVING manpower and SAVING every possible pound of pay-metal.

Working hand in hand with practical foundrymen, MODERN engineers have proved, in more than 30 years of service, numerous types of charging, melting and pouring systems for ferrous and non-ferrous foundries — LARGE AND SMALL! We'd like to plan with you, too.

If your problem calls for much special engineering, write it up for a full and free discussion by our lay-out engineers. If you already know your requirements the coupon can be used for obtaining the standard, FREE literature . . .

MODERN

MODERN EQUIPMENT COMPANY
Port Washington, Wisconsin

MODERN EQUIPMENT CO. DEPT. A1, Port Washington, Wisconsin

Mail to my attention:

Catalogs on metal pouring systems and ladles ☐
Cupolas and cupola chargers, catalog 147-A ☐
Cranes and Monorail systems, catalog 150 ☐
More information on FREE use of MODERN, color, sound films ☐

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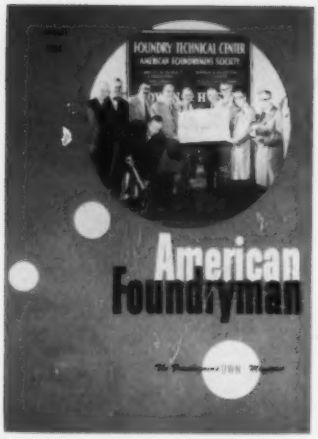
Street ..... **Zone** .....

City ..... **State** .....



C. L. Carter, President, AFS, handles shovel during groundbreaking for new headquarters on November 17. Watching ceremony, from left: R. J. Teetor, Chairman, AFS Housing Committee; D. J. Hayes, AFS staff; W. N. Davis, AFS staff; Owner's Representative F. C. Riecks, Ford Motor Co., Detroit; AFS Secretary-Treasurer Wm. W. Maloney; W. G. McCarthy, Giffels & Vallet, Chicago; AFS Vice-President F. J. Dost; Des Plaines, Ill., Mayor Kenneth G. Meyer; and C. E. Hoyt, retired AFS Executive Vice-President.

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American Foundryman

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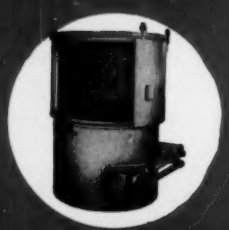
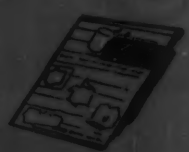
MELTING AND HOLDING FURNACES



Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.



Bulletin 351 covers the complete melting line. Write for your copy today.

LINDBERG-Fisher A DIVISION OF LINDBERG ENGINEERING CO.

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Talk of the Industry

FINE FLAKE GRAPHITE in facing improves flowability, surface finish, and enables the sand to be worked a little dryer, according to a foundryman noted for his smooth, precise green-sand castings. Facing mix includes two per cent by volume of graphite and eight per cent by volume of wood flour. Base sand has an AFS fineness number of 118.

METAL CORE BOXES cast from shell patterns are being used at Cooper Alloy Foundry Co., Hillside, N. J. Pattern is produced by spraying low melting alloy from a gun devised by company engineers onto a core plug to a thickness of approximately 3/16 of an inch. Reinforcing ribs and bosses for dowels and blow holes complete the shell pattern.

CLAY CONTENT of molding sand can be determined with confidence by the polarographic method reported in "Binding Property of Molding Sand," Report of the Castings Research Laboratory, No. 4, 1953, issued by Waseda University, Tokyo, according to conclusions of the authors, Dr. Jiro Kashima and Mototaka Mutaguchi.

GRAIN REFINEMENT of 90 Cu-10 Al alloys by boron nucleation (boron added as a copper-base alloy) has resulted in as much as 13 per cent increase in tensile strength and 46 per cent increase elongation according to the work of J. P. Dennison and E. V. Tull published in Vol. 81 of the Journal of the Institute of Metals. Results obtained in the laboratory are entirely confirmed by commercial scale tests with 500-lb billets. Boron as boron carbide is believed to be the active nucleating agent. Solidification involves initial formation of the beta phase.

STAINLESS STEEL PROPELLORS weighing some 200 lb will be cast in shell molds at the New York Naval Shipyard. Object is to develop a casting method that will eliminate most of the extensive grinding to final shape required in traditional practice. Molds will be assembled from three identical sections and are expected to be poured without back-up.

UREA RESIN SAND MIXES (2 per cent water, kerosene for release, fine sand, 4 per cent resin) are being blown experimentally into fiber-glass reinforced plastic driers. Resulting cores are baked in a dielectric oven, assembled, and poured without back-up. Tolerances that can be held are not known; work is still in early experimental stages.

FOUNDRY VENTILATION problems often can be solved more simply and at lower cost than foundrymen realize. Lead concentration in the atmosphere of a Michigan bearing shop was brought below maximum allowable concentration merely by relocating existing fans to establish proper air flow patterns.

20,000 INSTALLATIONS
Lower Cost to You!

Type D ROTO-CLONE combines design and mass production economies to make it the lowest priced dust collector in its class.

Why is ROTO-CLONE priced so low? Manufacturing experience with 20,000 Type D ROTO-CLONES has introduced production economies reflected in low cost to you—the lowest cost of any collector in its class. By class we mean units of 1,500 to 15,000 cfm capacity designed for handling dry, granular dust.

Why are space requirements less? ROTO-CLONE* provides everything you need, except duct connections, in one complete, shop assembled package—high efficiency collector, exhauster, motor, drive and dust storage hopper. This compactness makes its relocation easy and economical with change in process, plant layout or production equipment.

Why is performance outstanding? ROTO-CLONE'S collection efficiency is constant regardless of exhaust volumes handled. Its cast-iron housing, cold-rolled steel blades, taper-lock hub and heavy-duty, antifriction bearings assure long, maintenance-free service.

For complete product information, call your local AAF representative or write direct for Bulletin 272.

*ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.

AAF

American Air Filter
COMPANY, INC.
104 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

VOLCLAY BENTONITE

NEWS LETTER No. 35

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

Cracked Castings:

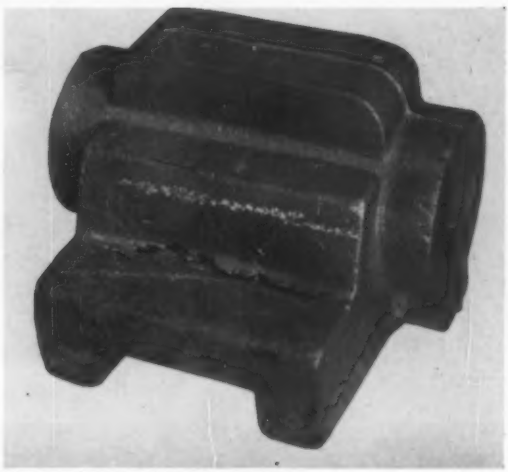


Photo compliments of George W. Anselman

Not all cracked castings are due to improper molding sands or their improper use.

It is true that it is essential to have a low baked or hot strength in the molding sand to avoid such defects, if molding sand contributes to this cause.

Panther Creek southern bentonite furnishes less hot, retained strength than any other bond used for the foundry. But even if southern bentonite is used as the bonding ingredient, it cannot insure against cracked castings if castings are mistreated at the shake-out.

The photo illustrates that if such castings are mistreated by attempting to knock-off the gates before the casting is completely solidified, cracks can occur in hot fillet areas.

Cracks can be developed by the metal pulling itself apart while cooling in the mold, if the hot compression strength of the mold is greater than the casting at this instant during solidification.

Poor casting design coupled with the normal contraction of the metal and being restricted by the mold, the flasks, the core, bars, gaggers, etc. can be responsible for such casting defects.

Sand mixtures of less hot strengths which do not resist contraction are certainly recommended, and therefore the use of Panther Creek southern bentonite is highly advised.

This defect is often termed as "hot tear" when the fracture takes place about, or just after, solidification of the metal. A liquid shrinkage crack has a similar appearance, but there is usually a cavity or porous area beneath the shrinkage crack.

By selecting the correct design and by insuring against high baked, or retained hot strengths with the use of Panther Creek, less cracked castings do occur, and such mixtures are encouraged.

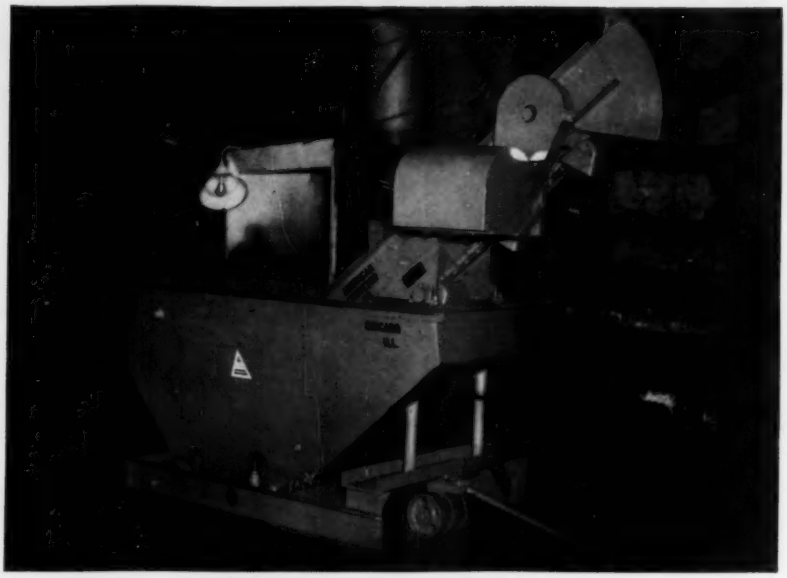
Write for "Economy in the Foundry", a free bulletin to those foundrymen desiring less scrap, better finish, and more production.

AMERICAN COLLOID COMPANY

CHICAGO 54, ILLINOIS

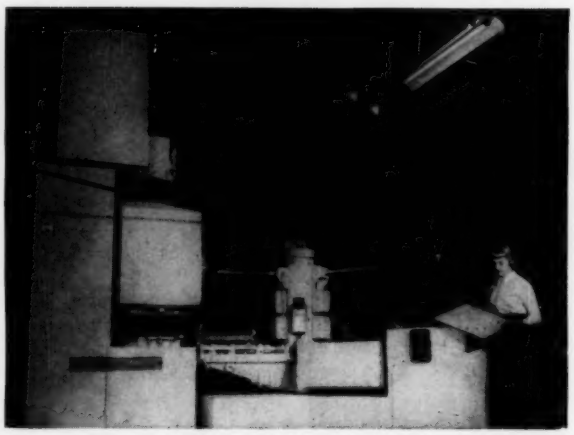
Producers of Volclay and Panther Creek Bentonite

Here's How...



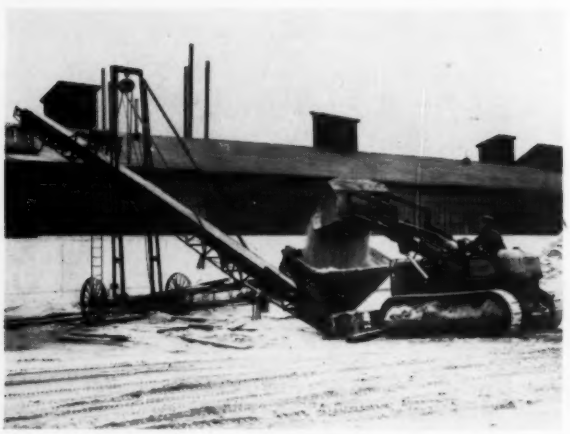
• • • this portable disposal unit granulates foundry slag in quenching tank, then discharges it for removal. Self-contained, can be placed in operation immediately. Movable from cupola to cupola; handles slag produced by cupolas melting from 5-25 tons per hour. Unit saves many hours of costly manpower, eliminates pits and foundations, is claimed to pay for itself in few months of operation. *American Conveyor Co.*

For more data, circle No. 56, p. 17



• • • the new, advanced line of Shellformatic shell molding machinery looks in action. Now on market, equipment includes both automatic and semi-automatic units, with full line of single and multiple pattern shell mold machines and supplementary fittings available. Unit shown is multiple station shell molding machine that accommodates three different patterns, is said to offer precise, fully automatic control of all operations during molding cycles. Manufacturer claims that efficiency and production have been materially increased over previous shell molding machines, and that many new advancements in engineering and design are being offered. Organization provides complete shell molding service. *Beardsley & Piper Div., Pettibone Mulliken Corp.*

For more data, circle No. 57 on card, page 17



• • • an HD-5 diesel-powered crawler tractor is equipped with Tracto-Shovel, front mounted, and used to load foundry sand from storage piles into elevating loader, which feeds sand through roof opening and into bins in core room. Shovel provides general flexibility for many uses around foundry area, allows accurate control of dumping and gradual feeding of sand to hopper. This feature prevents hopper from jamming, as often happens with non-controllable loading equipment. Other auxiliary equipment for tractor makes it valuable work horse around metal working plants, supplements other machinery in heavier loading, excavating, or similar jobs. Specifications, fully illustrated catalog, and other data available upon request. *Allis-Chalmers Mfg. Co.*

For more data, circle No. 58 on card, page 17

IMPROVE
Sand Control...

CUT
Scrap Losses...

DROP
Sand Temperature...
and

DELIVER *MORE* SAND—*FASTER!*

Here's what one of the efficient PEKAY Mixer-Mullers now in use is doing: increasing *Permeability*, giving a big boost to *Green Compression Strength;* maintaining correct *Moisture Content;* and delivering this *better* sand at an increase in volume per hour of 85%!

What's more, the amount of bonding clay and Bentonite added to the prepared sand has been *sliced in half.*

And *Maintenance Costs* are sharply cut because this smartly engineered unit is so easy to inspect and to service. *Power Costs* drop sharply, too.

CUTTER wheels are designed to eliminate lumps, give even distribution, provide consistent free-flowing characteristics.

Muller wheels put sand (delivered on conveyor belt from cutters) in perfect condition for molds. Capacity can be increased as desired.

END view shows compactness of 3-stage unit installation, approximately 20 ft. long, 2 ft. high. Single or Double-stage units are available.

PEKAY

Mixer-Muller

for better sand conditioning

THE PURCHASE PRICE IS LESS—AND INSTALLATION COSTS ARE MUCH LOWER. No excessive initial investment is needed to put the PEKAY Mixer-Muller to work in your plant immediately to save you money and give you faster production of a better product. Installation usually takes only about 100 man-hours of labor.

On every count, this unit deserves your careful consideration.

AND HERE'S ANOTHER LOW-COST WAY TO BETTER PRODUCTION

PEKAY AIRATOR

Easy to install—low initial cost—little maintenance

SEND FOR COMPLETE DETAILS, PRICES, TODAY!

Specialists in Foundry Sand-Handling Engineering & Equipment

PEKAY MACHINE & ENGINEERING CO.

869 N. SANGAMON STREET CHICAGO 22, ILLINOIS

M-T-MATIC Elevator Conveyor Buckets
TROFF-O-MATIC Conveyors

Gentlemen:

Please send me details and price information on the PEKAY Mixer-Muller.

NAME _____ TITLE _____

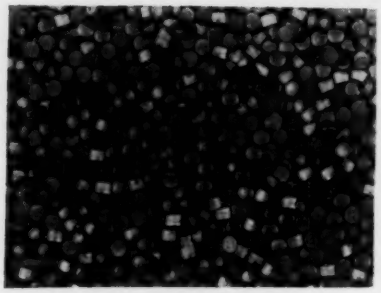
COMPANY _____

STREET & NO. _____ CITY _____ ZONE _____ STATE _____

Products & Processes

For additional information,
use postcard at bottom of page 17

continued on page 12



Economical Shot

A newly-organized firm announces production of steel shot of high quality and low cost for metal blasting, cleaning, peening, tumbling, cutting and abrading industries. Company says users have found method of cold-forming the shot and grit gives uniform hardness, longer life, and a greater density. Available in all sizes. *Steel Shot Corp.*

For more data, circle No. 59, p. 17

Tool Finisher

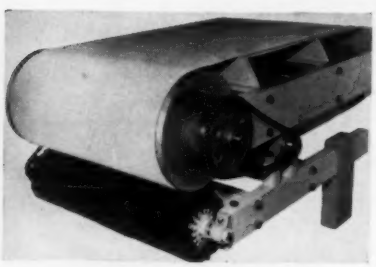
Vari-Tool Finisher permits microfinish on end, top and side clearance angles on single point tools without diamond wheel or highly skilled operators. Each side equipped with 10″ x 7″ tilting table. *Standard Electrical Tool Co.*

For more data, circle No. 60, p. 17

Shaker Conveyor

Full line of shaker conveyors available for operations involving hot or abrasive materials. Move horizontally, upgrade or downgrade for distances up to 500 ft. Several materials can be transported separately, with feed and discharge arranged at various points along trough. Constructed for heavy duty, conveyors yet are lightweight, portable, quickly assembled. Can be installed where head room is extremely limited. Normal capacity is 100 tph. Powered by 10, 15, or 20 hp electric motors or 10 or 25 hp air motors. Supplied with trough sections ranging from 12-36 in. widths, 6-16 ft lengths, and 6-18 in depths. Angle sections available where trough line turns. Has many foundry applications. *Goodman Mfg. Co.*

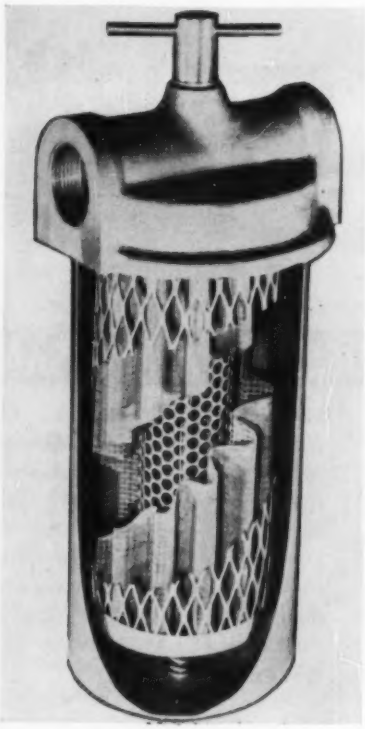
For more data, circle No. 61, p. 17



Conveyor Brush Drive

Fullergript conveyor belt cleaning brushes now offered with power takeoff from conveyor belt itself. Counter shaft chain-driven at one end by head pulley, other end connected by chain drive to brush. *Fuller Brush Co., Industrial Div.*

For more data, circle No. 62, p. 17



Water Filters

All models of established line of oil filters now adapted to water. Manufacturer claims maximum active filter area, longer periods of operation, no moving parts, simple maintenance. Mesh from 30 to 200. *Marvel Engineering Co.*

For more data, circle No. 63, p. 17

Protective Dust Hood

Weighing only 5 oz, this comfortable hood protects worker while allowing unrestricted vision through large picture window. Made of very lightweight cloth, hood may be worn with respirator. Economically priced. *Gen. Scientific Eqpt. Co.*

For more data, circle No. 64, p. 17

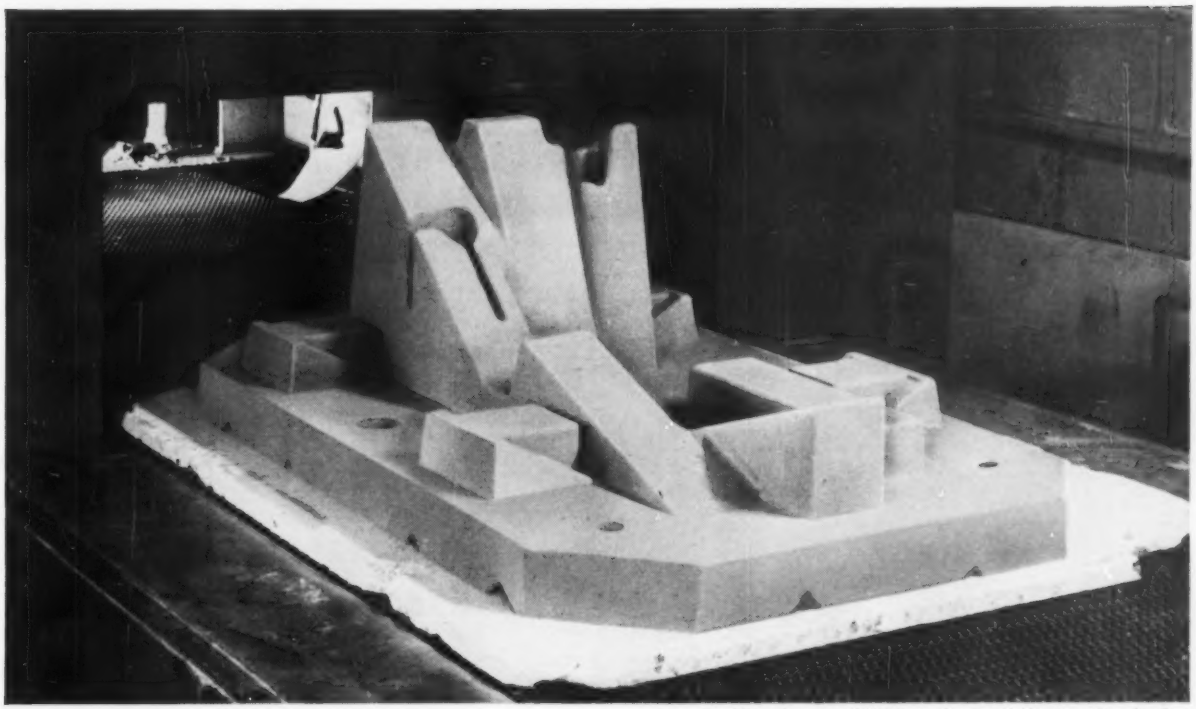


Photo Courtesy of Wollaston Brass and Aluminum Foundry Co.

New odor-free urea core binding resin

Monsanto's Resimene 970 cuts baking time up to 40 percent, compared to oil-bonded cores...

To its long list of research-built resins serving the foundry industry, Monsanto now adds Resimene 970—a new urea formaldehyde core binder that eliminates odor at the muller and core making station, and produces better baked cores in 40 percent less time.

Resimene 970 produces unusually accurate cores with sharp edges and no loose sand grains to rub off. Cores have greater over-all strength to withstand rough handling; reduce core scrap.

More than this, Resimene 970 eliminates shakeout problems and fissures . . . means less gas, greatly improved water resistance, less oven maintenance, and fewer scrap castings. Also, with Resimene 970 an underbaked core is a rarity.

If your problem is to eliminate unpleasant odors at the muller or core making station – or a production bottleneck – Resimene 970 can solve it. Why not send for full information today? The coupon is for your convenience.

Look to Monsanto for the latest research-built resins for foundry use

Core Binding . . . Foundrymen find Monsanto a ready source of a full line of phenolic and urea core binding resins. Call on Monsanto for the job-fitted resin that best meets your individual needs.

Shell Molding . . . Monsanto produces a full line of resins specifically for the new shell molding process. You – like hundreds of other foundrymen – can look *first* to Monsanto for the latest developments, information and know-how on shell molding.

Lytron 886 Sand Conditioner . . . Another Monsanto development for the foundry. In sand casting, Lytron 886 sand conditioner produces units with superior finish, requiring less clean-up. Lytron 886 reduces rejects, simplifies sand moisture control.

Resimene, Lytron: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS – PLASTICS
®

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 5601, Springfield 2, Mass.

Please send me full information on Resimene 970 core binder ☐; Lytron 886 sand conditioner ☐; Monsanto resins for shell molding ☐, core binding ☐.

Name & Title _____

Company _____

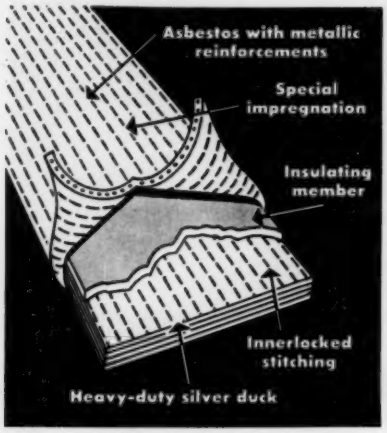
Address _____

City, Zone, State _____

Products & Processes

For additional information,
use postcard at bottom of page 17

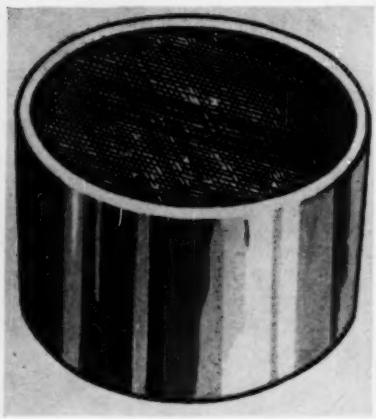
(continued on page 17)



New Hot Belting

Special wire reinforcing for maximum resistance to abrasion and impact is feature claimed for new hot belting, Sahara Armored. Two types: insulated, for materials from 300-450 F, and super insulated for 450-600 F. Asbestos content permits handling red-hot material without damage to belt itself. *Imperial Belting Co.*

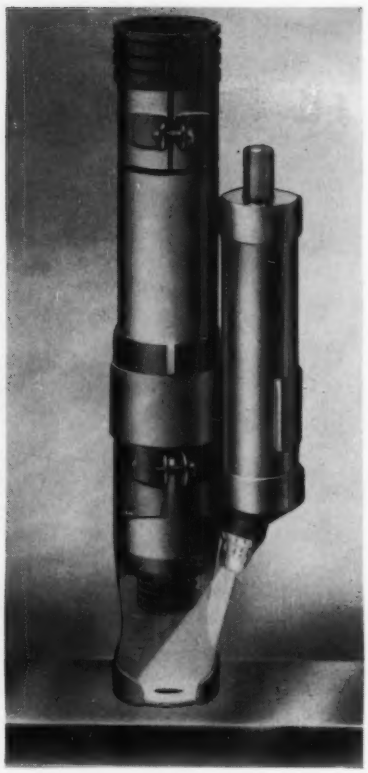
For more data, circle No. 65, p. 17



Core Box Vent

This foundry core box vent is being made especially for D-process shell molding. The new-type vent is made from stainless steel screen, 150-mesh, and is reputed to need no cleaning. The vent can be furnished in sizes from 3/16 to 1 in. Product is now available on the market. *Wm. Demmler & Bros.*

For more data, circle No. 67, p. 17



Hardness Reader

New low-cost Brinnell microscope-reader measures indentations. Field diameter 7.5 mm. Magnifies 20 diams. Prefocussed battery-type illuminator. *Pacific Transducer Corp.*

For more data, circle No. 69, p. 17

Steel Safety Glove

New safety glove protects fingers with steel caps on three fingers of each hand. Each tip said to resist pressure of two tons. *Wolverine Shoe & Tanning Corp.*

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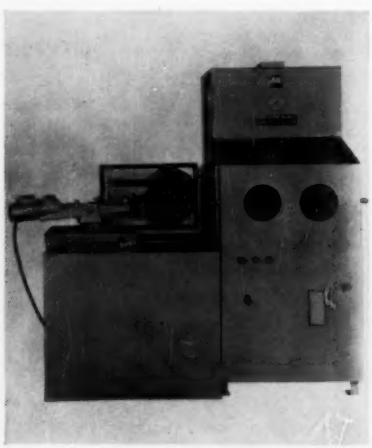
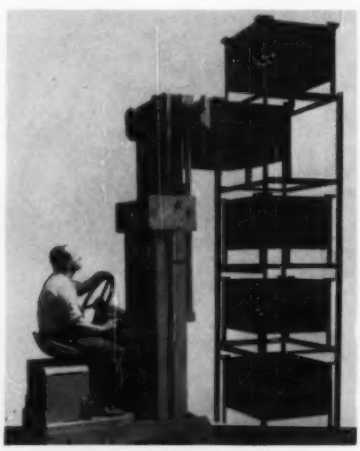


Versatile Barrel

Pressure Blast Roto-Barrel designed for bulk, high-production finishing of small castings. Can also be operated manually. Variable speed drive. *Cro-Plate Co., Inc.*

For more data, circle No. 68, p. 17

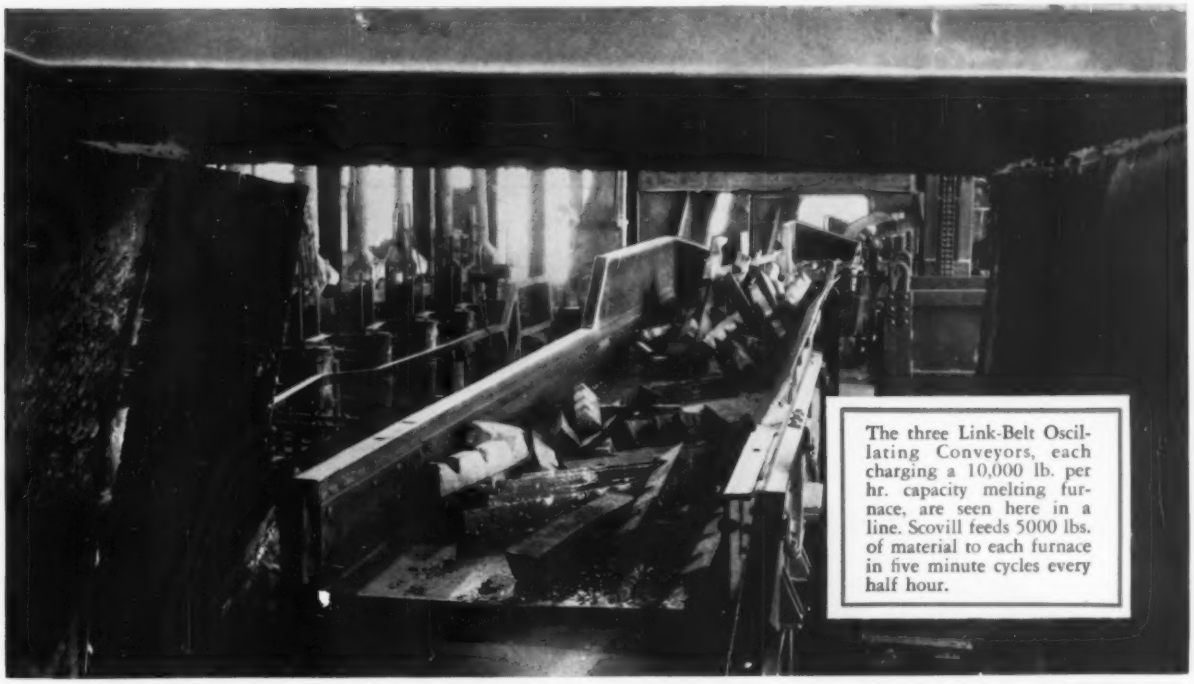


Space-Saving Stacking

Load unit, load racks, and Load-Mobile fork truck comprise efficient, flexible, space-saving handling and loading system. Saves manpower, manhours. *Market Forge Co.*

For more data, circle No. 70, p. 17

How to charge a brass melting furnace with 1000 lbs. per minute



The three Link-Belt Oscillating Conveyors, each charging a 10,000 lb. per hr. capacity melting furnace, are seen here in a line. Scovill feeds 5000 lbs. of material to each furnace in five minute cycles every half hour.

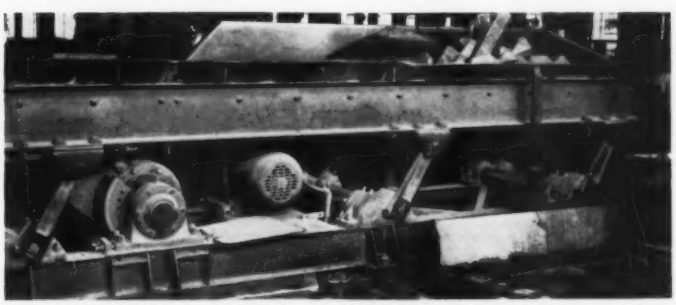
Three LINK-BELT Oscillating Conveyors at Scovill Mfg. Co. feed industry's largest brass furnaces

FEEDING 5000 pounds of any material in five minutes is a difficult assignment. And it's even tougher when the charge consists of various types of brass furnace charges — compressed bales, cut rods, rough extrusion stumps, coarse machine cuttings, copper and zinc slabs and pigs.

In cooperation with the engineers of Scovill Mfg. Co., Waterbury, Conn., Link-Belt foundry specialists worked out the answer. Now Scovill charges three melting furnaces with Link-Belt Oscillating Conveyors. The rugged, all-metal troughs handle sharp, jagged, heavy materials with virtually no wear . . . provide uniform flow regardless of surges.

These versatile conveyors are also widely used in foundries to separate sand and castings. The feed end section has a perforated plate bottom to act as a shakeout, and the discharge section is utilized for spruing and sorting the castings.

Whenever you have a handling or sand preparation problem — large or small — you'll find it pays to call your nearby Link-Belt office. Our foundry engineers will work with you and your consultants — help you get the finest in mechanized facilities.



To cushion the effect of repetitive shock loading, Link-Belt Oscillating Conveyors at Scovill are driven through Link-Belt Electro-fluid Drives. Rugged torsion-mount design operates at low frequency, requires only infrequent servicing, assures long life.

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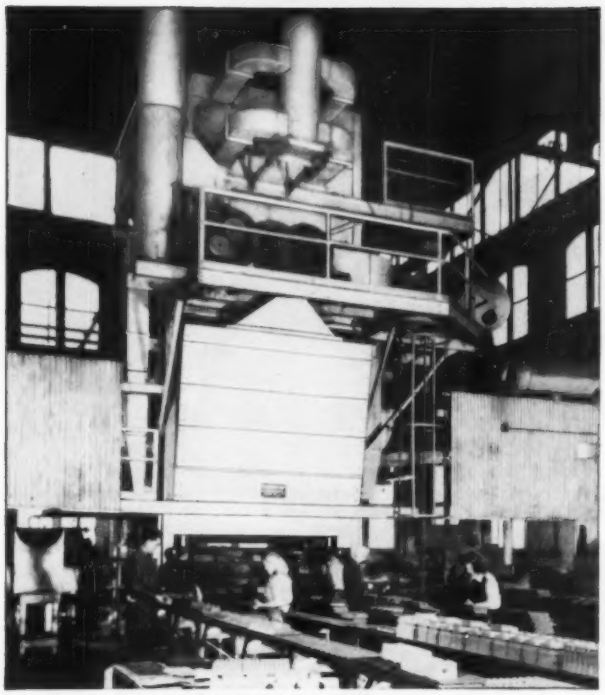

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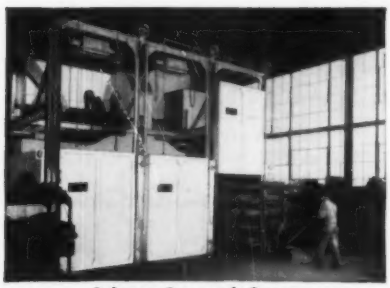

Coleman Transrack Ovens
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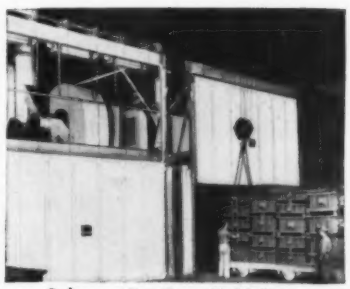
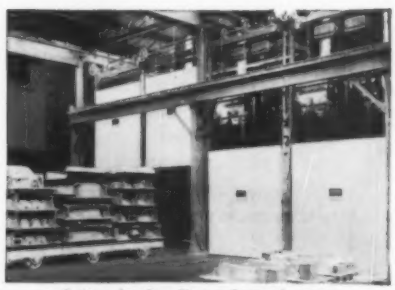


Coleman Car-Type Mold Ovens
at Clark Brothers Company



Coleman Car-Type Core Ovens
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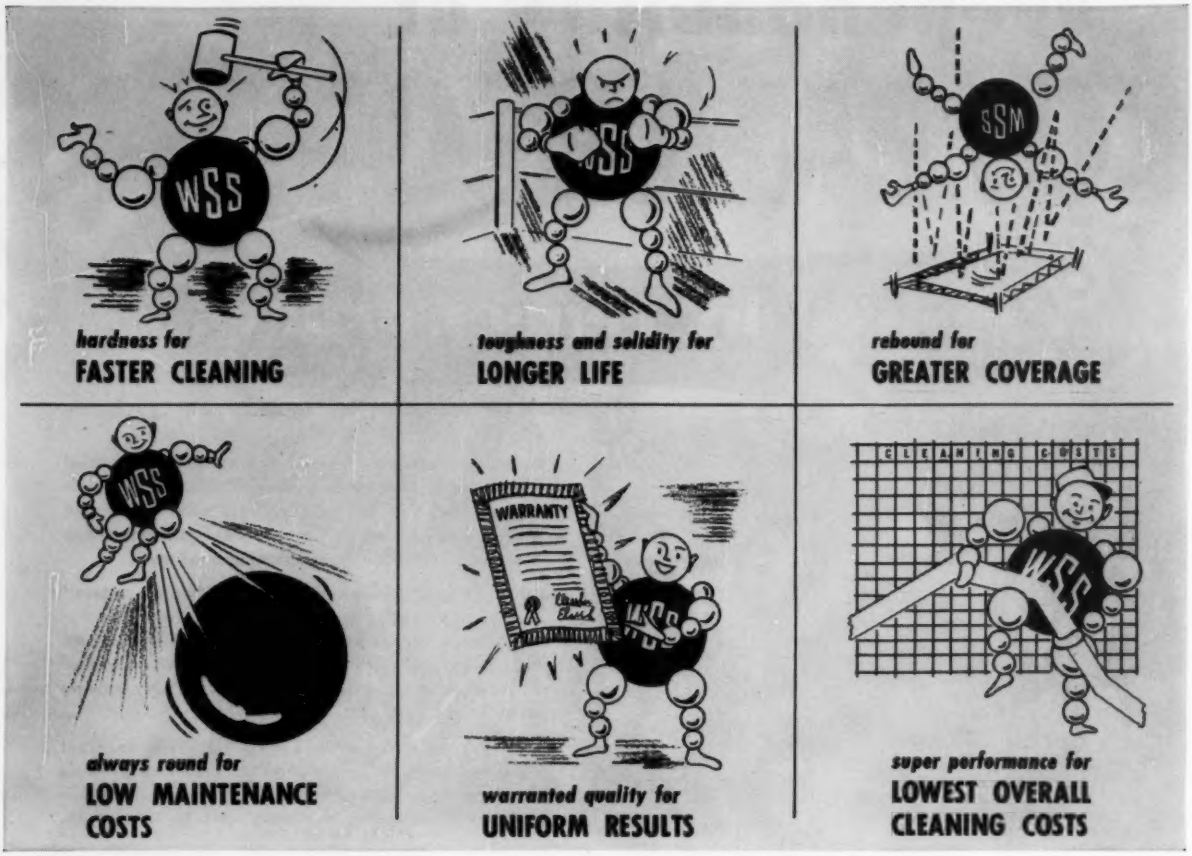

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Products & Processes

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Continued from page 12

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Steel-Reinforced Flooring

New "packaged unit", heavy-duty flooring combines heavy steel mesh and special filler for surfacing floors subjected to extra-tough abuse. Claimed to outlive building itself, Steel-Rock is engineered to combat tons of heavy rolling traffic. Resilient filler in grid compacts to level of steel ribs, permitting wheels to ride on steel without noise and slipperiness of solid steel surface. May be applied over new or old surfaces of wood or concrete, inside or outside. *United Laboratories, Inc.*

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Automatic Sand Distribution

Hoppertrol is electronic device which controls air cylinder-operated plow over molders' hoppers and bins, eliminating a worker from a bad position, and an expensive ventilation problem. Level of sand is held between two chosen and adjustable levels in order to prevent too-frequent plow movement. Electrical interlocks allow only one plow to lower at a time, reducing needless wear on belt and plow, and preventing the plowing off of small dry trails of sand into subsequent hoppers. A signal board can be arranged and installed to indicate which hoppers are filling. Manufacturer says device will save trouble and money by automatizing the distribution of sand in your foundry. *Harry W. Dietert Co.*

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Dual Purpose Respirator

This dual-purpose respirator has twin cartridges for organic vapors or filters for dust. Facepiece contoured of soft rubber for snug, comfortable, leakproof fit even with light tension. Inhale and exhale check valves prevent rebreathing of organic vapors. Twin-treated wool-felt filters with high filtration factor for dust. Easily replaced. *Chicago Eye Shield Co.*

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Sensitive Sheet Wax

Pressure-sensitive adhesive backing on new sheet wax allows easy attaching to all surfaces. Backing results from two years development and testing, opens more fields for use of sheet wax, lessens labor and muss on such jobs as build-up work in pattern industry. Adhesive-coated wax sticks to any clean oil-free surface and sheets can be used repeatedly if not damaged. Available in all thicknesses from 0.007 in. to 8 x 12 in. and 12 x 24 in. standard sheets. Softening point 166-168 F, with special formulations available to 270 F. *Kindt-Collins Co.*

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Conveyor Roll Bearing

Circular describing a new low friction bearing for conveyor rolls is now available. Described are the ball retainer, bearing types, roll sizes and method of operation. *Logan Co.*

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Free Foundry Information

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Pouring Time Chart

A pouring time chart for gray iron is now available. Chart shows pouring time in seconds, weight of castings in pounds and metal thickness. *Harry W. Dietert Co.*

For more data, circle No. 77 on card

Air Vibration Equipment

A 16-page illustrated catalog, No. 109, has been published describing vibration equipment, including metallic-impact types and air-cushioned vibrators which operate with a minimum of noise. Operating photos show vibrators in use by a wide variety of industries. The catalog contains an engineering data sheet which can be filled out and returned for information and advice on vibrator requirements at no charge. *Cleveland Vibrator Co.*

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Vibrating Screen

A booklet, No. 122-J, describing Style J Vibrex vibrating screen is ready for distribution. The screen is especially recommended for use in foundry clean-up work. A copy of the booklet may be obtained by writing *Hewitt-Robbins, Inc.*

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Hoisting Equipment

Yale hand and electric hoisting equipment is described in Bulletin 1567. The 12-page booklet illustrates the most suitable hoist for the big job, the specialized job, the occasional job and every job. Differential, screw gear and spur geared hand hoists are compared for relative efficiency and initial costs. *Yale & Towne Mfg. Co.*

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Electrode Performance

A booklet entitled *"Improved Standards of Electrode Performance"* is now available. Pointing out that the cost-per-ton of steel is directly related to electrode consumption, the booklet discloses the results of studies made by electrode specialists on the effects of tighter joint assemblies to efficient electric furnace operations. It features an illustrated list of approved practices in adding electrodes to the column. *Electrode Div., Great Lakes Carbon Corp.*

For more data, circle No. 81 on card

Silica Sand

A flowsheet study on recovery of low iron silica sand by flotation is now available. The flowsheet describes each step of the flotation process and deals with such typical problems as corrosive pulp conditions, the abrasive action of coarse, granular, slime-free washed sand, and the fast settling of the sand. *Denver Equipment Co.*

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Blasting Equipment

Complete information of deburring, die and mold polishing, blending grind lines, scale removal, honing of cutting tools and pre-plating cleaning with both regular velocity and high velocity pressure blast wet-blasting equipment is now available in a fully-illustrated, 8-page booklet. Dozens of before and after photographs depict actual case histories, and sections of the booklet are devoted to automatic, high-production rate machines, abrasives and metal-gard. *The Cro-Plate Co.*

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Induction Heating Generators

Folder describing electronic induction heating generators for brazing, soldering, hardening, annealing and melting is now available. It is well illustrated and lists specifications of the unit. *Induction Heating Corp.*

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Industrial Ovens

Bulletin 200 is a catalog illustrating and describing convectioneered industrial ovens. Design features and engineering flexibility of 13 types of ovens are fully explained in the 12-page catalog. *W. W. Sly Mfg. Co.*

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continued on page 89

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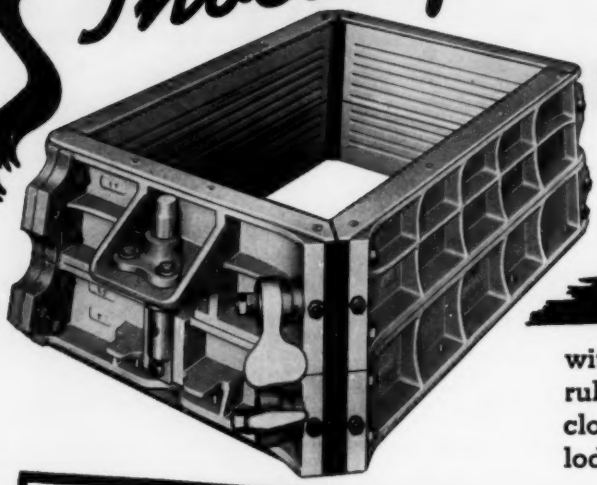

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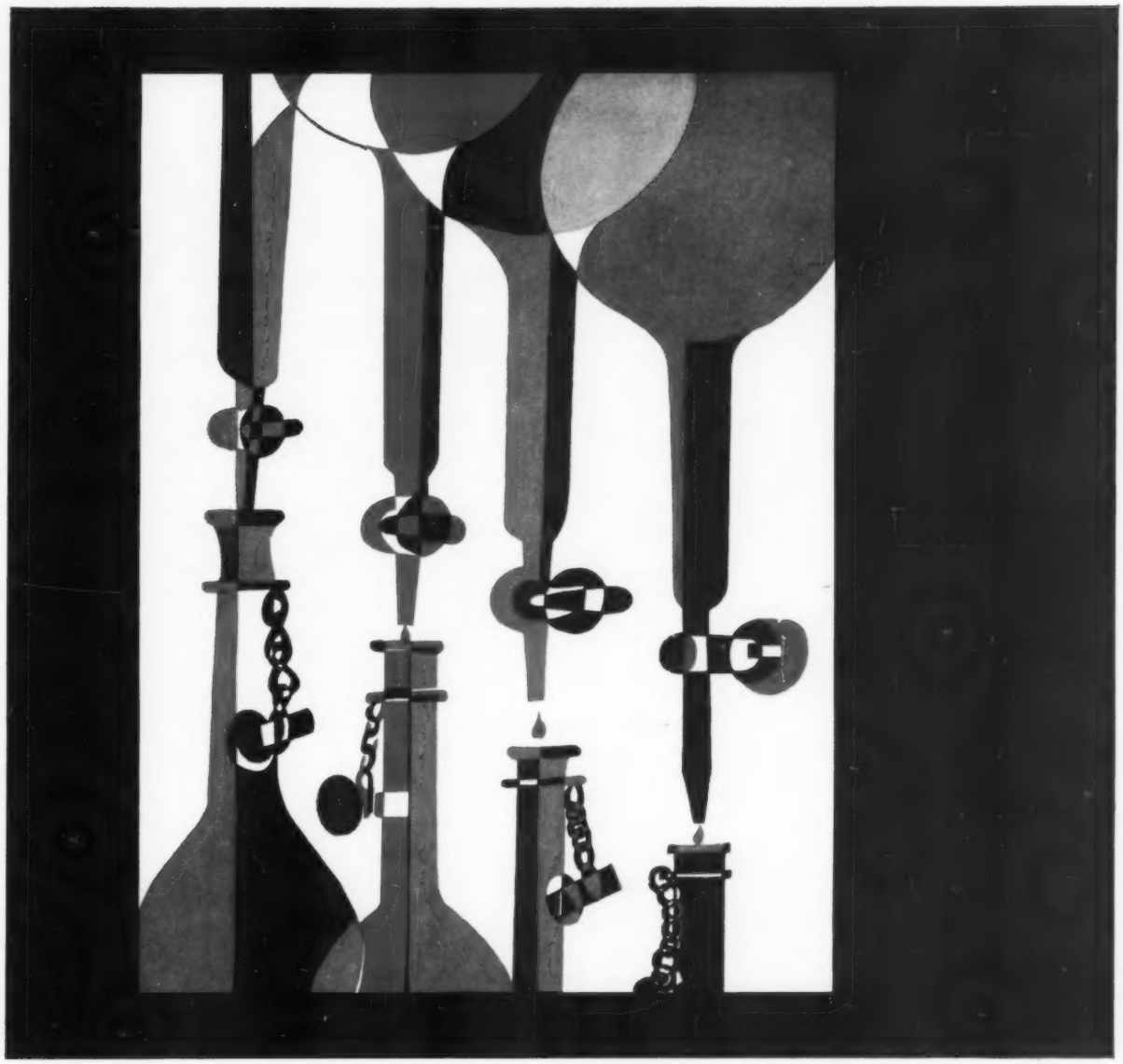

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Incentive System

Please mail to the writer's attention two copies of the article *"Make the Foreman a Part of Your Incentive System"* by John Taylor of Lester B. Knight & Associates, which appeared in the October issue of AMERICAN FOUNDRYMAN.

C. R. BRENNAN, *Purch. Agent*
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St. Louis

More on Rapid Silicons

I read with great interest A. E. Cartwright's article *"Rapid Control Method for Silicon in Malleable"* (AMERICAN FOUNDRYMAN, May 1953, p. 93) and the subsequent exchanges of Prof. Carl E. Shubert and Albert C. Holler with Mr. Cartwright (AMERICAN FOUNDRYMAN, July 1953, pp. 22 and 96). I should like to present, along with the discussion of Cartwright's method, two other methods known to me.

1. The rapid control method published by Hubert Kempf in *Stahl und Eisen*, vol. 62, 1942, p. 136, was applied in 1942 at the laboratories of the August-Thyssen-Hütte, A. G. Duisburg-Hamborn, Germany, and is as follows:

Dissolve 1.0 gram of the sample, passed through 80 mesh, in 25 ml of exactly 66 per cent perchloric acid (10 parts of 70 per cent acid and one part of distilled water) in a 500-ml beaker over a burner.

Add carefully to avoid frothing, 100 ml of water. (To prevent the danger of acid occasionally spattering on the worker's sleeves during the continuous mass analyses as they took place in the laboratories mentioned above, the following method was used: The water was introduced into the beaker through a bent glass tube. This inlet tube was connected by means of a short rubber tube with a pinchcock to a second glass tube leading from a container of distilled water.)

Filter with Suction

Filter with suction, through a small filter tube using a 1-cm high pulp pad (filterbreistopfen). Wash off the precipitate from the beaker, into the filter tube by means of a water spray. Rinse twice with hot hydrochloric acid (1:5) and three times with hot water. Time for filtration and washing—one minute.

Burn and ash the pulp pad with the precipitate in a platinum container (50 x 40 x 10 mm) placed in an electric furnace with a stream of oxygen passing through it, at a temperature of 1000 C. Time required for ignition is two minutes. Weigh on the rapid balance and read off the Si equivalent from the table. Time required—¾ minute.

The total time for the Si determination, including the weighing of the sample, is 6¼ minutes. In 1942 this method was compared with the standard methods then used in Germany and recommended as a rapid control method. It is to be noted that in order to complete this method in 6¼ minutes, special equipment and preliminary work are required.

Rapid Method Explained

2. The rapid method mentioned in *Chemical Analysis of Cast Iron and Foundry Materials* (published in London, 1951) by A. Westwood and A. Mayer, p. 216, is as follows:

Place 1.0 gram of sample in a dry 400-ml beaker and add 25 ml of warm (50 to 60 C) perchloric acid (63:37). After the main reaction is over, boil, and continue rotating the beaker to wash down undissolved particles from the side. Dissolution is complete after two to three minutes.

Add about 100 ml of water cautiously to avoid frothing. Direct the stream along the wall of the beaker. Filter on a small pad using suction from a filter pump. Wash twice with hot hydrochloric acid (20:80) and transfer the entire precipitate to the pad by means of a bobby using three or four washes of hot water. Finally wash once with alcohol, place the pad and entire precipitate into a platinum crucible, and ignite in a stream of oxygen at a temperature of about 1000 C. About two minutes are required for the ignition. Cool, brush out, and weigh the silicon dioxide.

This method is applicable to all cast irons with the exception of tungsten alloys. Time required is 10 to 14 minutes.

Referring to Cartwright's method, I should like to discuss some ideas, previously mentioned. I compared the dissolving of gray cast iron samples with a composition of graphite 3.02 per cent, combined carbon 0.35 per cent, and silicon 2.42 per cent per Kempf, Westwood-Mayer, and Cartwright. All three methods are safe to use, as the authors indicated. There is no danger of an explosion because as the sample dissolves, the released graphite flakes consisting of low-active carbon are in turn oxidized by the acid. It is obvious that by dissolving samples of white iron, with the carbon in a combined state, the danger is completely excluded.

It seems simpler to use only one perchloric acid for dissolving. This acid, as known, gives the most complete recovery by dehydration of the metasilic acid. The perchlorates are easily soluble in water, and this is advantageous in the washing that follows. I have found it better to dissolve the sample in a larger beaker and in a larger volume of a less concentrated acid, as Kempf and Westwood-Mayer suggested. In this case, there is less chance of spattering from the introduction of water, and the precipitate can be easily transferred without the aid of a policeman.

One can agree with the arguments against filtering with suction through the filter paper and platinum cone and subsequent ignition in oxygen only after experimental testing for the precipitate in question. From my laboratory experience I know that filtering, washing, and ashing, as mentioned above, are generally fast and complete. However, the filtering proposed by Cartwright through the permanent asbestos pad and the dehydration in three minutes without oxygen is valuable for its simplicity. The platinum crucible is most suitable for the rapid method.

The cooling of the beaker and crucible on the copper plate is an innovation for the method offered. For rapid cooling of metal specimens, bowls or crucibles, I use a copper disk of 15 mm thickness within an aluminum desiccator. Sometimes for the cooling of a massive specimen, I plunge the lower part of the desiccator into running water—fast and hermetic cooling are obtained.

Some of the steps which Mr. Cartwright laid down in the time-saving principles of his method undoubtedly have advanced rapid foundry control.

PAUL T. ROUX, *Chief Chem.*
H. C. Macaulay Foundry Co.
Berkeley, Calif.

Brass Melting

In the July issue you published *"High Efficiency Brass Melting in Low Frequency Furnaces"* by G. N. Landis. We would like to obtain tear sheets.

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If you think of carbon only in terms of complete furnace linings, check these other important locations in and around the furnace where "National" carbon brick and shapes will also save time and money as a maintenance refractory:

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- ✓ ***CINDER NOTCH LINERS***
- ✓ ***CINDER NOTCH PLUGS***
- ✓ ***SPLASH PLATES***
- ✓ ***SKIMMER PLATES***

. . . and Many More!

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation, *30 East 42nd Street, New York 17, N. Y.*

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

COUNT 'EM . . .
JUST COUNT 'EM!

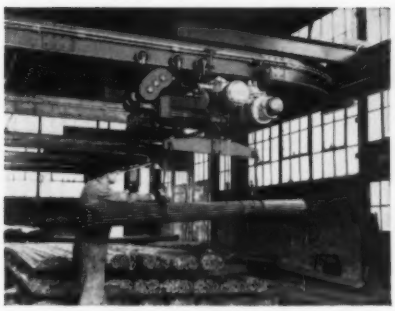
TENNESSEE
PRODUCTS & CHEMICAL
Corporation
NASHVILLE, TENNESSEE

It's as simple as 1 and 1. Tennessee Products' ferrosilicon and ferromanganese briquettes contain exact amounts of these ferro alloys. Just count out the required number for your cupola charge. You eliminate time-consuming weighing, and facilitate rigid product control for a faster, more economical foundry operation.

Ferrosilicon is available in lump, sized and powder form as well. TENNESSEE also makes low phosphorous pig iron and high grade malleable pig iron for the metal industries.

For complete details contact Tennessee Products & Chemical Corp., First American National Bank Building, Nashville 3, Tennessee.

MONORAIL *Pays!*

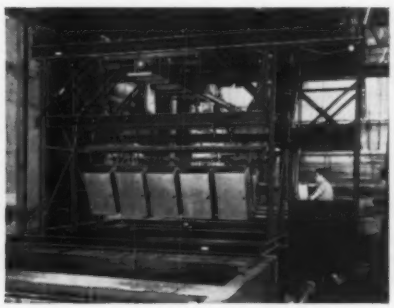


INCREASES TONNAGE

From 26 to 48 tons of steel rod per day was the increased movement produced by a properly engineered monorail system.

LOWERS COST

This simple system actually saved $150 in handling costs within four months of operation. No more sheet-by-sheet movement.



SAVES TIME

Passage, on monorail, of metal parts through infra-red dryer, cuts 70% from former drying time. All other handling in plant on monorail.

MORE CAPACITY

30% more capacity was added to metal cleaning process by handling a third more units on carrier with one man operation from cab control.

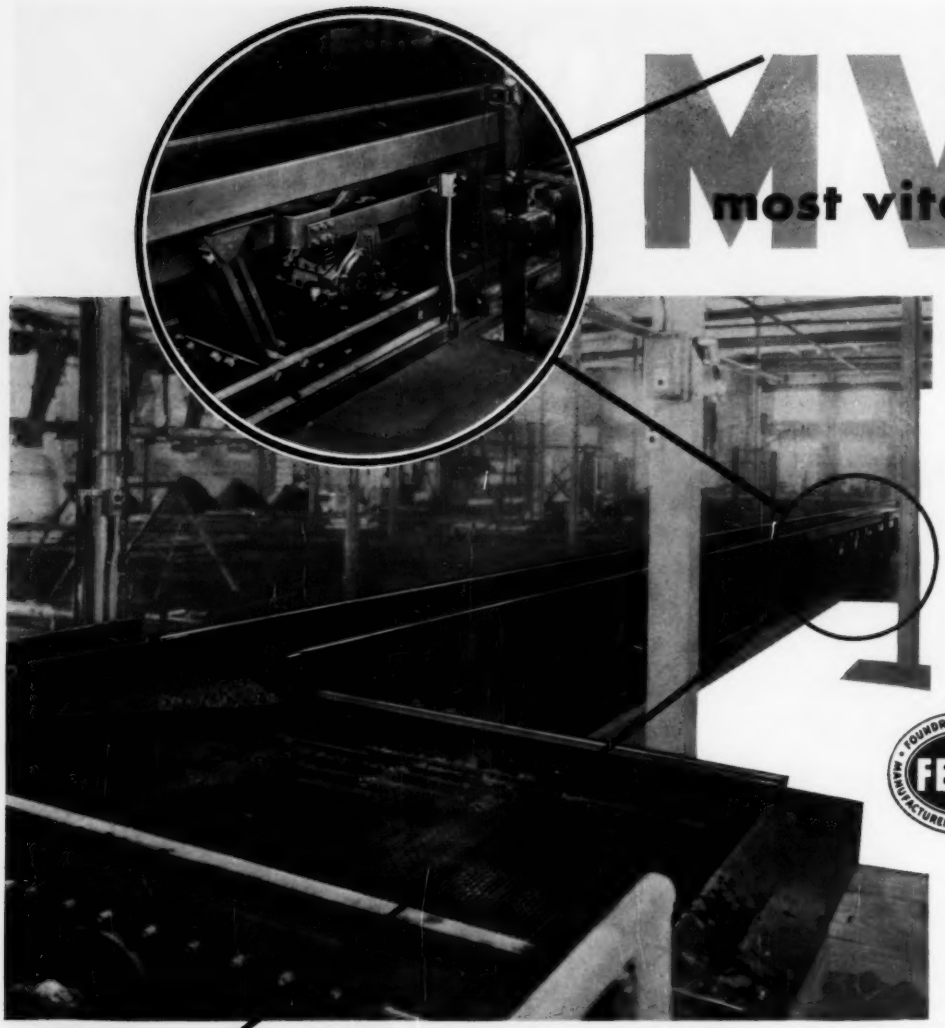
LESS LABOR

Operators claim to save 26 man hours per truck over former unloading time. Interlocking monorail cranes in the plant also reduce handling costs.

Write for Bulletin C-1
showing many more cases where MONORAIL PAYS!

THE AMERICAN MONORAIL COMPANY

13122 ATHENS AVENUE **CLEVELAND 7, OHIO**



MV most vital!

MV links molding stations to central shakeout. No special mounting required; lag screws keep MV rigid.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. FEMA

MECHANICAL VIBRATING CONVEYORS MOVE SAND AND CASTINGS WITH MINIMUM WEAR—AND WITHOUT LEAKAGE

Jeffrey's dependable Mechanical Vibrating Conveyor is a *most vital* factor in this foundry's mechanization program. After the molds are poured, this "MV" conveys the sand and castings to the central shakeout. The unit is 24" wide and 80' long, driven by a single motor. It is sturdy and leakproof, with no wearing parts in contact with the conveyed material.

MV's are ruggedly built for continuous handling of large capacities at steady speed. Each is backed by Jeffrey's long experience in designing and manufacturing all types of foundry equipment. Our engineers will work closely with you and your consultants to insure most effective mechanization.

WRITE FOR CATALOG 859

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

SHELL MOLDING

PATTERN EQUIPMENT

MATCHED COPE & DRAG SHELL MOLDING BOXES, COPE & DRAG PLATES FOR PRODUCTION

GET POSITIVELY "MATED SHELLS" WARPAGE FREE

WE PRESSURE CAST SHELL MOLDING PATTERN EQUIPMENT TO YOUR SPECIFICATIONS IN ALUMINUM OR BRONZE. GET OUR QUOTATION.

SAMPLE ZINC BASE, ALUMINUM AND BRONZE CASTINGS FOR AUTOMOTIVE, HOME APPLIANCES AND OTHER INDUSTRIES REQUIRING PILOT MODELS.

MATCH PLATES
MULTIPLE COREBOXES
COPE & DRAG-PLATES
LOWEST CLEANUP COST
PROMPT DELIVERY

ALUMINUM AND BRONZE
COPE and DRAG PLATES
WE ALSO MANUFACTURE PRESSURE CASTING EQUIPMENT
TO ORDER

PRESSURE CAST PRODUCTS CORPORATION
1030 VERMONT AVENUE DETROIT 16, MICH. Tel. TAshmoo 5-8188

Foundrymen in the News

A. L. Foscue has been appointed president of Electro Metallurgical Co. and United States Vanadium Co., divisions of Union Carbide and Carbon Corp. He succeeds **Walter E. Remmers** who becomes chair-

A. L. Foscue . . . Electro President

man of both Electro Metallurgical and United States Vanadium, and a member of the Appropriations Committee of Union Carbide. Mr. Remmers is also a vice president of Union Carbide.

Harry A. Schwartz, manager of research for National Malleable and Steel Castings Co., Cleveland, has recently retired from full-time work. He will assume the newly created position of assistant to the vice-president in charge of production. Dr. Schwartz was awarded the John A. Penton Gold Medal of AFS in 1930 and in 1939 received the E. J. Fox Gold Medal of the Institute of British Foundrymen, being the only American ever to receive that honor.

Link-Belt Co., Chicago, has appointed **Harvey V. Eastling** general manager of the Pacific Div., San Francisco, Cal.

Doctor Alexander R. Troiano has been named head of the department of metallurgy at Case Institute of Technology. He succeeds the late Professor Kenneth H. Donaldson.

Doctor George A. Roberts, has been elected vice-president in charge of Technology, Vanadium-Alloys Steel Co., Latrobe, Pa., and **Dr. John C. Hamaker, Jr.,** has joined the metallurgical research department of the firm.

Eugene J. Schwetz has been transferred to the Capitol Foundry Co., Phoenix, Ariz., a subsidiary of the National Malleable & Steel Castings Co. Mr. Schwetz's new position will be as chief metallurgist. He was formerly project metallurgist at the company's Chicago works.

Ellsworth M. Smith has been named vice-president and chief metallurgist of Penn Precision Products, Inc., Reading, Pa.

George W. Myers has been appointed president of Crucible Steel Casting Co., Milwaukee, succeeding **Richard D. Colburn,** who continues as a director of the Misco Corp., Chicago, the parent company.

Frank W. Jenks, vice-president, International Harvester Co., Chicago, has been elected a director of American Steel Foundries and Joseph B. Lanterman, controller of American Steel, has been elected vice-president of the firm.

Sterling Wheelbarrow Co., Milwaukee, has appointed **Seward E. Shaver** to serve as exclusive west coast district manager with offices in Palo Alto, Cal. Mr. Shaver

S. E. Shaver . . . District Manager

was previously employed by Archer-Daniel-Midland Co. in the Core Oil Div., known as the Werner G. Smith Div.

Harold G. Liebond has been named director of Silica Chemicals, Inc., new subsidiary of Cleveland Quarries Co., Amherst, Ohio. **George S. Love** was named secretary-treasurer.

V. A. Guebard, Jr., has been appointed general superintendent of the gray iron foundry, International Harvester Co., Milwaukee, succeeding Elijah Rice, who has retired. **Frank Yearling,** formerly assistant general superintendent of the Chicago Tractor Works foundry, has succeeded Mr. Guebard as assistant general superintendent in the Milwaukee gray iron foundry.

Robert G. Nightingale, former chief engineer of the Colson Corp., has been appointed director of the engineering staff of Wheeler Associates, Inc., Cleveland.

Joseph D. Brubaker has been named treasurer and director of Standard Horse Nail Corp., New Brighton, Pa., succeeding the late A. L. Bingham. **W. C. Sheers,** formerly manager, service and quality control, has been appointed plant manager of the firm and **O. J. Molter,** former superintendent, will be associated with Mr. Sheers as time estimate and process consultant.

Alton W. Bardeen, formerly chief metallurgist, Ohio Brass Co., Mansfield, Ohio, has been appointed technical director, succeeding the late Richard W. Parsons.

Joseph Glyman and **Henry Lanthier** have joined the supervisory staff of Bone Engineering Corp., Glendale, Cal. Mr. Glyman was formerly associated with Misco Precision Casting Co., Detroit, and National Lead Co., New York. Mr. Lanthier, assistant to Mr. Glyman, has been associated with Kerr Mfg. Co., and American Precision Co., both of Detroit.

Col. John Slezak, assistant secretary of the Army, and president of Turner Brass Works, Sycamore, Ill., has been awarded the General Levin H. Campbell medal for distinguished ordnance service.

Fred N. Eaton has been appointed works manager of the foundry division of Aluminum Industries, Inc., Cincinnati, Ohio. Prior to his appointment he was manager of the foundry division of Bohn Aluminum and Brass Corp.

Samuel Frankel has sold his interest in Foundry Services, Inc., New York, and has resigned as president and director of the firm. **Herbert A. Frankel** has resigned as secretary and director. The firm has retained both men in a consulting capacity.

William O. Bosserman has been named managing engineer of the Anodes Div., Sipi Metals Corp., Chicago.

Peyton L. Morgan, Jr., has been appointed southern district engineer for the Air Appliance Div., U. S. Hoffman Machinery Corp., New York.

continued on page 30

L. N. Shannon, Stockham Valve & Fittings, Birmingham, Ala., displays the *Grande Medaille d'Honneur* which was awarded to him at the recent Paris International Foundry Congress. Mr. Shannon has just retired as president, International Committee of Foundry Technical Association, and is a former President of AFS.

Famous CORNELL CUPOLA FLUX

CONDITIONS IRON FOR BETTER CASTINGS, REDUCED SCRAP LOSS

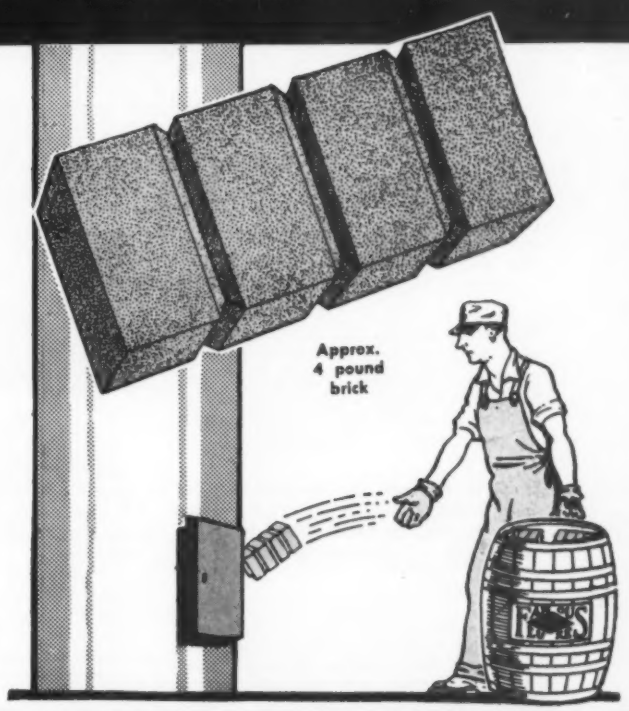
Take the advice of leading foundries — gray iron and malleable with cupolas (our regular customers) and use Famous Cornell Cupola Flux with every charge of iron to remove impurities and increase fluidity.

YOU WILL BE IMPRESSED with the great improvement in castings. They are stronger, cleaner, tougher and rejects are practically nil. Sulphur too, is greatly reduced and slag is kept fluid.

AND HERE'S ANOTHER MONEY SAVING FEATURE: Famous Cornell Cupola Flux keeps cupolas cleaner, reduces digging out time to practically nothing. And it forms a glazed or vitrified surface on brick or stone lining, reducing erosion and repairs.

Made in Pre-Measured SCORED BRICK FORM for accurate and low cost fluxing of iron charges.

WRITE FOR BULLETIN NO. 46-B



The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

Foundrymen in the News

continued from page 28

Otto W. Winter, president of the Winter Engineering Co., will head Beardsley & Piper's new Shell Mold Division. His background will supplement the experience of the firm's machinery engineers in designing and producing equipment for shell molding. A comprehensive consultation service will also be made available by the firm.

O. W. Winter . . . Heads Division

R. L. Jones, assistant works manager, American Steel Foundries, East St. Louis, Ill., has been named works manager of the firm's Indiana Harbor Works in East Chicago, Ind.

Richard G. Tessendorf, general works manager of plant operations, Aluminum Industries, Inc., Cincinnati, has been elected vice-president. He is vice-chairman and director of the Aluminum Association.

Charles W. Snyder has been named district sales manager in Delaware and parts of New Jersey and Pennsylvania for DeWalt, Inc., Lancaster, Pa., subsidiary of American Machine & Foundry Co., New York.

Leslie B. Bellamy, Detroit district manager, Sterling Abrasives Div., Cleveland Quarries Co., Amherst, Ohio, has been named general manager of the division in Tiffin, Ohio.

Emil Wachtel, E. Wachtel Co., San Francisco, has been appointed northern California representative for Precision Castparts Corp., Portland, Ore. He was formerly with Allied Engineering & Mfg. Co., Redwood City, Calif.

Robert K. Beck has been elected president of the Apex Smelting Co., Chicago. He succeeds W. A. Singer, chairman of the board, who held the office since 1923. All other officers and directors remain the same.

Four staff personnel of Frederic B. Stevens, Inc., have been promoted. **Frank Watt** was appointed general sales manager for the metal finishing and foundry divisions. He was formerly sales manager for the metal finishing division. **Guy Cummings,** an electrical and sales engineer, takes over Mr. Watt's former post. **Clair Crawford,** a service engineer, has been named sales manager for the foundry division. **Dr. J. A. Ridderhof,** formerly manager of the foundry facing department, has been appointed manufacturing manager and director of research for the foundry facing and buffing composition departments.

A. T. Peters, former assistant plant superintendent, Bay City Div., Dow Chemical Co., was named plant manager for the division.

Richard Herold has been appointed to the position of vice-president—foundry sales, of the Taylor-Wharton Iron and Steel Co., He will have his headquarters at High Bridge, N. J., where the company's manganese and alloy steel foundry operation is located. **John P. Reynolds** was appointed sales manager for the High Bridge plant and **Joseph A. Trainor** was appointed sales consultant to the vice-president.

R. Herold . . . Vice-President

The Board of Directors of the Metropolitan Brass Founders' Association, Inc., has appointed **John C. Spring** secretary-treasurer to take the place of the late Miss Dora Ostroff.

The A. P. Green Fire Brick Co., Mexico, Mo., has appointed **L. L. Edwards** general manager of its new direct representative and distributor organization the A. P. Green Fire Brick Co. of Texas. **E. C. Miller** was appointed district sales manager of the firm's Indianapolis office.

Gilbert T. Bowman has been named manager of Products Dept., Meter & Valve Div., Rockwell Mfg. Co., Pittsburgh, Pa., and **O. W. Barnett** was named manager of Nordstrom valve products.

Richard I. Allen has been appointed sales manager, Weiger Weed & Co., Div., Fansteel Metallurgical Corp., in Detroit, and **Floyd Cessna** became district manager in Cleveland.

Three assistant controllers have been appointed by Hewitt-Robins, Inc., Stamford, Conn. They are: **Austin Franklin, Howard Stoughton** and **R. B. Lape.**

J. Joseph Smith has been named manager of plant facilities for American Locomotive Co., Schenectady, N. Y. He has been manager of the locomotive division plant of the company since 1945.

Joseph Abusamra, has been appointed vice-president and general manager of Belcher Malleable Iron Co., Easton, Mass.

Fred E. Greger, has been named sales manager of Standard Works Div., Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.

Sydney E. Gregory has been appointed Illinois and Indiana sales representative of Alloy Precision Castings Co.

William R. Ellenberger has been appointed sales engineer in charge of sand reclamation installations in the foundry industry for Nichols Engineering & Research Corp., New York.

Two new grinding wheel sales representatives have been named by Electro Refractories & Abrasives Corp., Buffalo, N. Y. They are **Robert J. Langan,** assigned to the New York metropolitan area, and **Donald W. Greve,** formerly with Aluminum Co. of America, who will cover Pittsburgh, western Pennsylvania and West Virginia. **Grant S. Diamond,** president of the firm has been elected vice-president of the Grinding Wheel Institute of Cleveland, Ohio.

AFS 50 year service button being presented to Frank Moritz, left, retiring floor molder at Hansell-Elcock Co., by H. S. Faust, center, the firm's president. S. C. Massari, right, plant manager, watches.

Power-Packed for Profit . . .

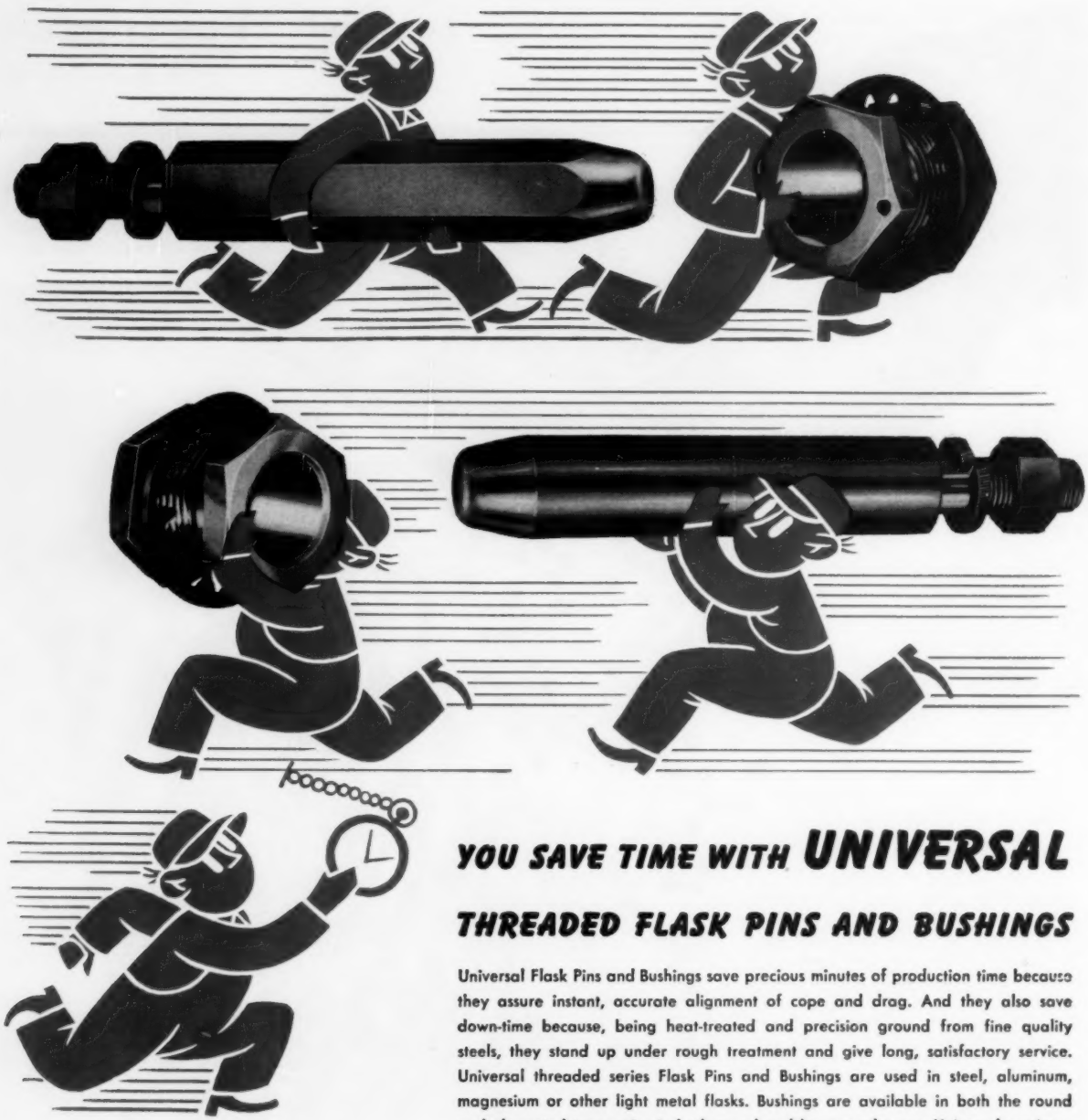
SHOT OR GRIT . . . that's Malleabrasive. Malleabrasive is scientifically heat-treated and laboratory controlled to clean *better, faster,* and last *longer*. Malleabrasive cleans *cheaper* because you save on parts repair and down-time . . . because its long life cuts abrasive purchases. Don't take our word for it. Prove it to yourself. Next time you buy blast cleaning abrasive, specify Malleabrasive from Pangborn Corporation, 1300 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the right abrasive for every blast cleaning job.

Pangborn DISTRIBUTORS FOR **MALLEABRASIVE**®

U. S. Patent #2184926 (other patents pending)

Pangborn BLAST CLEANS CHEAPER
with the right equipment for every job

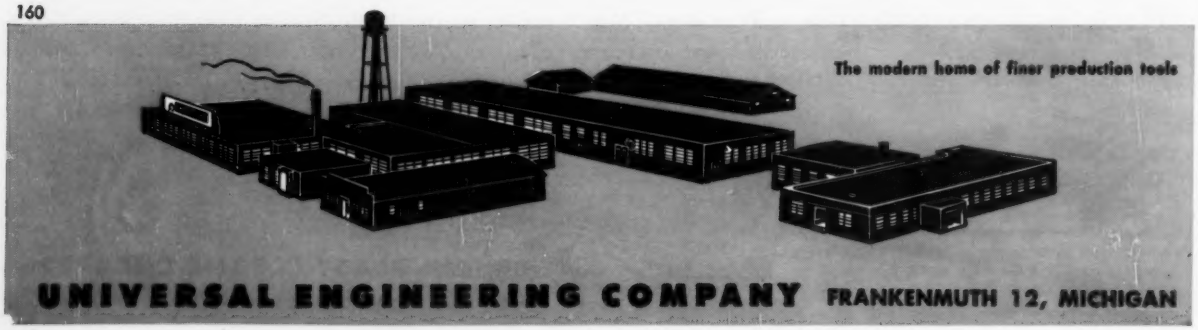


YOU SAVE TIME WITH UNIVERSAL

THREADED FLASK PINS AND BUSHINGS

Universal Flask Pins and Bushings save precious minutes of production time because they assure instant, accurate alignment of cope and drag. And they also save down-time because, being heat-treated and precision ground from fine quality steels, they stand up under rough treatment and give long, satisfactory service. Universal threaded series Flask Pins and Bushings are used in steel, aluminum, magnesium or other light metal flasks. Bushings are available in both the round and elongated types; pins in both round and hexagonal types. Universal carries a complete line of sizes of its threaded series as well as its taper and plain series Pins and Bushings as regular stock items. For further information write to the Universal Warehouse nearest you — 1060 Broad St., Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

160



14 STANDARD SIZES IN STOCK

FOR IMMEDIATE SHIPMENT

ALSIMAG® Ceramic STRAINER CORES

2 SPECIAL COMPOSITIONS

AlSiMag 564 (White)
Economical, withstands pouring temperatures of iron, aluminum, bronze, brass, and similar metals.

AlSiMag 202 (Tan)
Special heat shock resistance. Excellent for all metals with exceptionally high pouring temperatures.

WRITE FOR FREE BULLETIN 532
for details on AlSiMag Strainer Cores—standard sizes and custom designs—and AlSiMag Cut-off Cores, Troughs, and Gate Tubes.

TEST THEM IN YOUR OWN FOUNDRY
Samples of standard sizes free on request. Samples made to your own specifications at reasonable cost.

MORE ECONOMICAL THAN SHOP-MADE SAND CORES

- Resistant to heat shock
- No erosion at any normal pouring temperature
- Non-spalling
- Completely free of gas
- Not affected by moisture
- Strong, will stand the roughest handling
- Do not contaminate scrap
- Flat and uniform

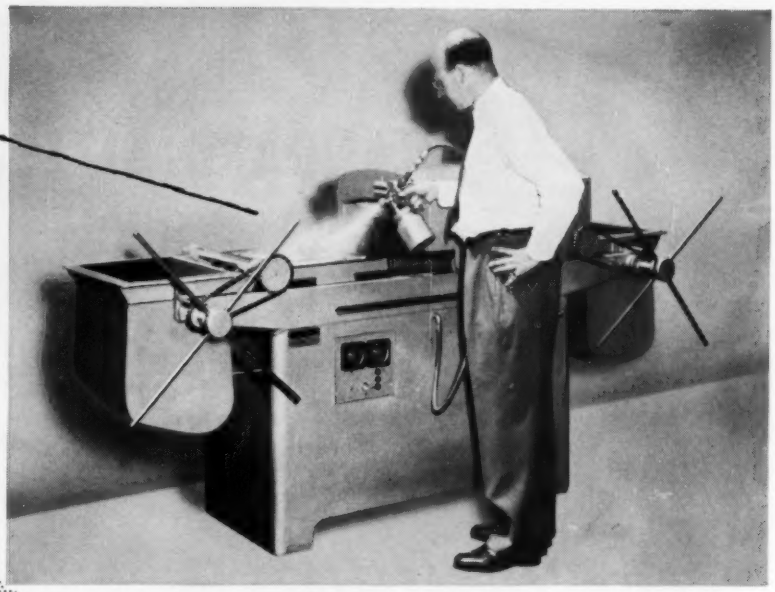
AMERICAN LAVA CORPORATION

A SUBSIDIARY OF MINNESOTA MINING AND MANUFACTURING COMPANY
CHATTANOOGA 5, TENNESSEE

REPRESENTATIVES: M. A. BELL CO., 217 Lombard St., St. Louis, Mo. • 3201 Sherman St., Houston, Texas • 3430 Brighton Blvd., Denver, Colo. • CANADIAN FOUNDRY SUPPLIES & EQUIPMENT LTD., 4295 Richelieu St., Montreal 30, Quebec • 49 Main St., Toronto 14, Ontario • FIRE BRICK ENGINEERS CO., 2400 S. 43rd St., Milwaukee 1, Wis. • E. J. WOODISON CO., 7415 St. Aubin Ave., Detroit 11, Mich. • 146 Chandler St., Buffalo 7, N. Y. • FRED H. McGEE, 120½ E. 7th St., Chattanooga, Tenn. • SMITH-SHARPE CO., 117 27th Ave., Los Angeles 58, Calif. • INDIANA PRODUCTS CO., 400 Union Bank Bldg., Kokomo, Ind. • HOFFMAN FOUNDRY SUPPLY CO., 1193 Main Ave., Cleveland, Ohio • EASTERN FOUNDRY SUPPLIES, INC., 109 Frelinghuysen Ave., Newark 5, N. J. • FOREMOST FOUNDRY SUPPLY CO., 645 N. Pine Ave., Chicago, Ill. • SPRINGFIELD FACING CO., N. Chicopee St., Willimansett, Mass.

52nd YEAR OF CERAMIC LEADERSHIP

SIMPLIFY SHELL MOLDING



President Frank K. Shallenberger of the Shalco Engineering Corp., Palo Alto, Cal., applying Dow Corning 8 Emulsion to one of the two patterns on his company's machine. Twin dump boxes and a rolling oven-and-stripper assembly permit two patterns to be used at once in alternating cycles. Cope and drag production are automatically balanced. Compensating springs and geared capstans help rotate pattern and box in one continuous operation. Capacity is in the range of one 14" x 18" shell every 30 seconds.

USE DOW CORNING 8 EMULSION

. . . the NEW Silicone Parting Agent that gives you clean, positive release of shell molds and cores at lowest cost

You'll save money and minimize your production problems by specifying Dow Corning 8 Emulsion to assure fast, clean release of shell molds. This noncorrosive, nonflammable silicone emulsion cannot break down at molding temperatures to leave a carbonaceous build-up on even the most complex pattern surfaces. That reduces pattern cleaning costs to a minimum; gives you faster, more continuous production of uniformly accurate shells. And that enables you to give your customers all they have learned to expect of the shell process: uniform castings that require a minimum amount of machining.

Dow Corning 8 Emulsion can be easily diluted with hard or soft water to any desired concentration. It is highly resistant to creaming or separating in storage or after dilution. And it is available at a new low price, 8% below that of previous emulsions. For more information and a free trial sample, call the branch office nearest you or fill out and mail this coupon today.

Send for sample TODAY

DOW CORNING CORPORATION, Dept. AV-13
Midland, Mich.

Please send me ☐ Free sample of Dow Corning 8 Emulsion
☐ Data on Silicone Release Agents for the Shell Process

Name _____

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DOW CORNING DOW CORNING SILICONES **CORPORATION**
MIDLAND MICHIGAN

ATLANTA CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D. C. (Silver Spring, Md.)

In Canada: Fiberglas Canada Ltd., Toronto In Great Britain: Midland Silicones Ltd., London

Positive Approach to Two Problems . . .

■ It's a safe bet that two of the major foundry problems cited during a survey made at the 1952 AFS Foundry Congress and Show—competition from non-cast products and getting more business—are with the foundry industry today in intensified form.

Like other industry, the foundry is readjusting from the style of living to which it has become accustomed over the past 10 or 15 years. Explanations of what is happening center on "inventory reduction," "seasonal slump" and "return to normal" (whatever normal is) along with a few dire predictions centered around the next two years. As might be expected, current business conditions have brought the usual price-cutting without regard for cost or quality.

For some years, business has not been too hard to get . . . production requirements have been high . . . salesmen didn't have to sell, they took orders. Now, it is the foundryman well-versed in fundamentals, and the salesman who learned selling the hard way, who once more come fully into their own.

What can foundrymen do about it? They can:

1. Better their present production techniques by using every source of information available in the foundry literature, through technical meetings, and plant visits. There never was a time when so many publications of all types were available to the foundry industry. Every foundryman should take advantage of this by developing and using his own foundry library.

2. Make the improvements in equipment and plant that have been planned but have had to be put aside during recent years while time was devoted wholly to production.

3. Refine cost accounting procedures so that most accurate possible figures are obtained. Cost information should be accumulated daily and weekly and compared with costs forecasts as a guide to efficiency.

4. Develop new markets and hold existing markets. Conversion of non-cast to cast products through intelligent design for and application of cast metals is one of the most fruitful possibilities here.

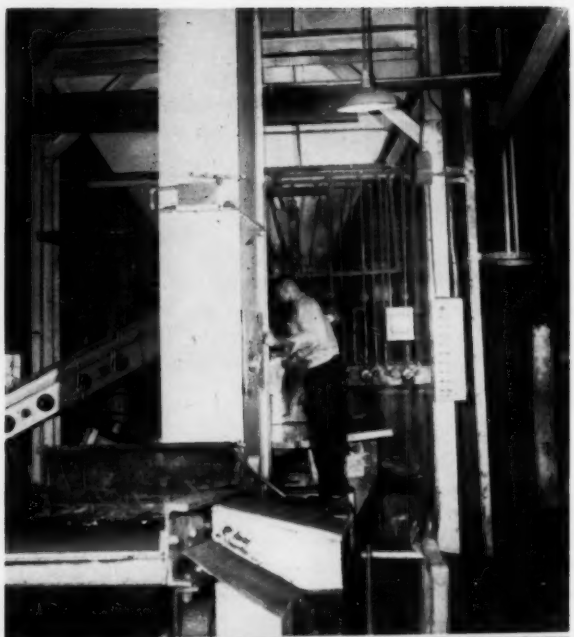
5. Stage customer clinics to show how castings are made, what services the foundry offers, and why the customer's castings are of high quality.

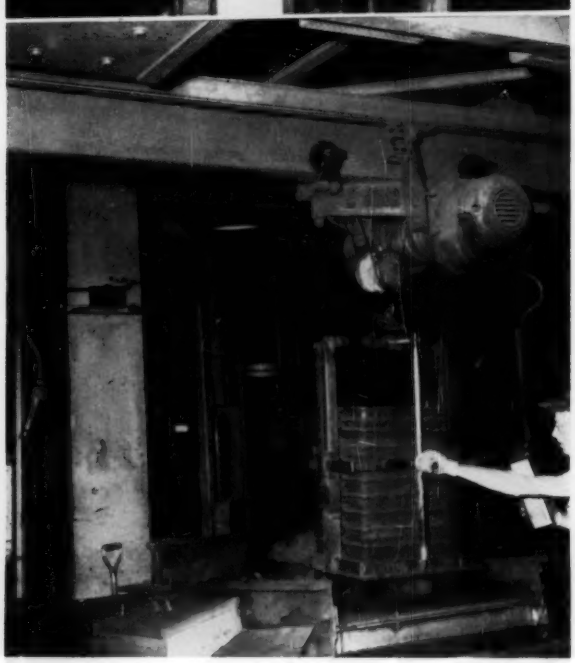
Such fundamental steps, perhaps along with intelligent application of some of the newer advances (page 95), will help keep business coming to progressive foundries and minimize competition from non-cast materials.

Wm. W. Maloney

Wm. W. Maloney
Secretary-Treasurer, AFS

Partial Mechanization Gives High Output in Small Area





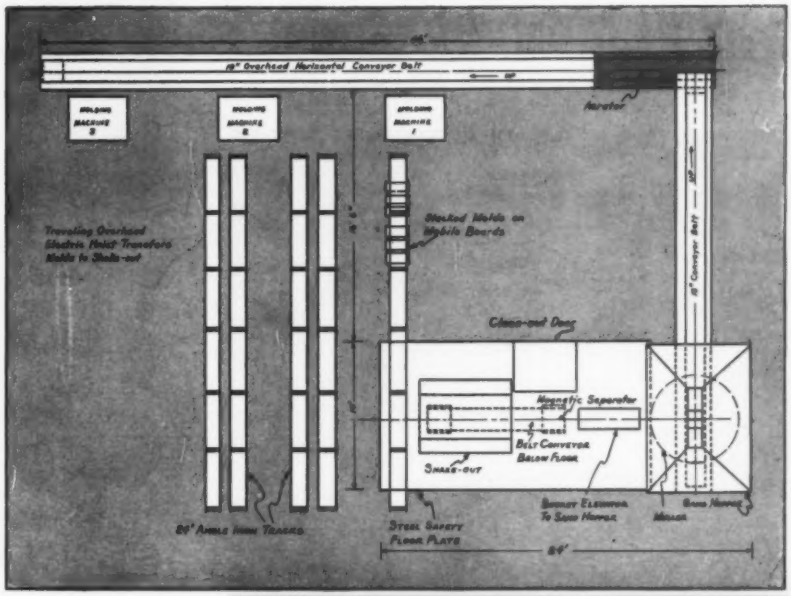
■ The combination of molding floors and conveyorized molding that typifies more and more foundries is well illustrated by the foundry of Cutler-Hammer, Inc., Milwaukee. A captive foundry, it is also a jobbing shop with some 8000 active patterns and an additional 4000 which may also be called into service at any time. Most of the castings are gray iron and nodular iron, but brass and bronze and aluminum castings are also produced for the company's line of electrical control equipment. Typical yearly production is 1600 tons of gray iron, 150 tons of nodular, and 160 tons of copper-base and aluminum alloy castings.

The gray iron is melted in a cupola, the nodular iron in a stack-charged, reverberatory furnace, and the non-ferrous alloys in oil-fired, pit-type furnaces. Most of the molds are set out on floors in traditional fashion, but one corner of the shop is mechanized for high production by stack molding. In this 27x46-ft area representing only 15 per cent of the entire shop, two molders each put up as high as 60 stacks (10 sections high) in eight hours. Three jolt-squeeze pin-lift machines are located in this molding area but only two are used ordinarily at any one time. A third man in the crew mixes sand, clamps molds, and pours. Shakeout is done by the regular night gang.

Overhead Distribution

Sand is supplied to the three machines by an overhead distribution system running along the wall. The belt conveyor can readily be extended to serve an additional 10 molders working along that wall of the shop. Though prepared sand is delivered by belt, hoppers are not used. Instead the sand is plowed off into a chute that delivers it in a heap beside the mold-

(Top) Sand bin and mixer are supplied with shakeout sand by bucket elevators. Portable conveyor leading into mixer from left is used for loading an occasional batch of non-ferrous sand. (Bottom) One man is easily able to shakeout entire stack with aid of overhead crane and special lifting frame. From shakeout, the castings slide into truck at far side for further handling.



Floor layout of stack molding area in Cutler-Hammer foundry. Nine tracks are normally used for stacks when area is operated at maximum capacity. Molding machine at left is used for stack molding when required, more often is replaced by one or two machines for making regular cope-and-drag molds in tight flasks.

ers. Sand for certain floor jobs can be taken off at the end of the belt.

Base sand used is a washed silica sand of AFS Grain Fineness 49. This is kept in a 30-ton storage bin which stands above the sand mixer. Sand in 900-lb batches is discharged alternately from the two discharge openings of the bin to prevent channelling and to avoid the "first in-first out" difficulty often experienced with undried sand. Batch weight is controlled by the amperage draw by the mixer. The operator runs the mixer as the sand is added and closes the hopper when the indicating ammeter shows 40. Western bentonite and sea coal are added by scoop and water is metered in.

Thirteen Per Cent Standard

Depending on the type of casting, green compressive strength is varied between seven to 12 psi. Above 12 psi, the sand has excessive dry and hot strength and lumps go over the screen above the storage bin. Total combustibles of 13 per cent is standard for the sand mixture. Sand is checked for green compression, permeability, and moisture with standard sand testing equipment.

Used molding sand reaches the storage bin by way of a mechanical shakeout which drops the sand onto an under-floor belt with a magnetic head pulley to remove metal. A bucket elevator raises the sand to the top of the storage bin where it passes through a vibrating screen before entering storage.

Conditioned sand discharges from the bottom of the mixer on to a conveyor belt which raises it to about four feet above floor level. Dropped into an aerator, the sand is fluffed up, then deposited on another conveyor belt which takes the sand overhead.

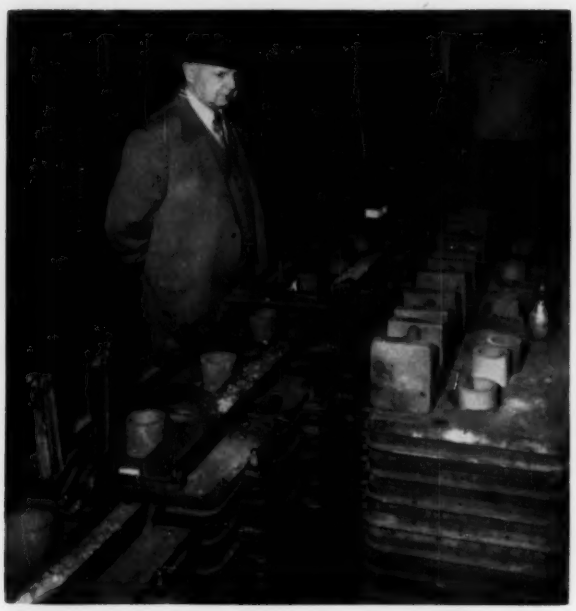
Molders make stack-mold sections in flasks 12 x 16 x 2½ in. Machines have the cope pattern mounted on the table, drag pattern on the squeeze head. Thus, when the sections are stacked 10-high, there are nine usable sets of mold cavities. A central sprue is generally used and it is formed by the drag pattern. Funnelling the sprue at the top of each section prevents

Floor of molds with green sand drags and cover cores produce high-yield, precise castings.

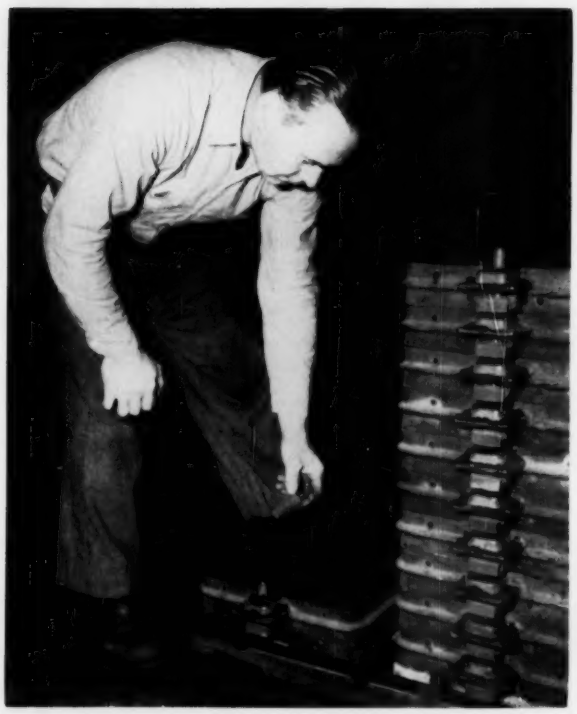
Conditioned sand reaches aerator (shown in center of illustration) by way of belt at right. From aerator it moves toward left for distribution to molders. Sand is brought from bottom of mixer, dropped into aerator from height of about four feet. In aerator, sand is fluffed up before elevation to distributor belt.

through the use of cover cores, production has been

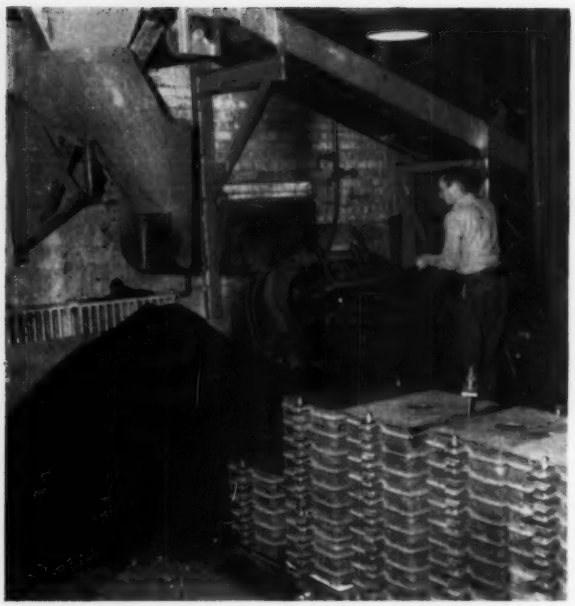
Partial Mechanization



Foundry manager Ed Bornfleth inspects row of stack molds clamped and fitted with pouring basins.



Sprue hole in bottom section of stack is plugged with core to keep metal in mold. Sprue core is made of oil-sand mixture and is dropped into bottom section of each stack to prevent metal from penetrating through the bottom board. Central sprue is generally used and is formed by the drag pattern.



View of sand handling system between aerator and overhead belt shows number one molding machine area.

metal from getting into a mold cavity until it has risen to that level in the sprue. An oil-sand core shaped like the sprue is dropped into the bottom section of each stack to keep metal from going through the bottom board.

To insure the correct amount of sand for squeezing, a shallow frame is placed on the mold section. After jolting and striking off excess sand, the frame is removed and the mold squeezed.

The molders use no facing and squeeze the mold sections to a hardness of 80 to 90. Patterns are aluminum or brass and are mounted in electrically-heated gray iron plates. Molders can control the electrical input to the strip heaters in the cope and drag plates independently. If a plate is too hot, dry sand sticks to the pattern. If too cold, sand sticks to the plate around the edge of the flask making runouts possible.

Insures Tight Joints

The gray iron plates in which the patterns are mounted are annealed to avoid possibility of cracking due to repeated jolting. Tight joints between mold sections are insured by grinding the plates to a flatness of 0.003 in. The patterns are held in the permanently-mounted gray iron plates by means of Phillips screws to simplify changes.

Bottom sections of stacks are put on four-wheeled bottom boards which run on tracks made of 2-in. angle iron. The tracks can be moved as molding conditions require. The tracks and bottom boards were made in the shop. Bottom board wheels were formerly the grooved rollers that supported a movable overhead airline in the brass shop.

As the stacks are assembled, they are pushed away from the molding machines until nine stacks are in line. To eliminate weight shifting, a set of nine stacks is clamped by means of tie bars that come up between

Stacks are rapidly poured by means of covered ladle on crane that bridges stack molding floor.

the molds at two places and at the ends to engage an angle-iron frame extending across all nine copes. Each cope is covered with a steel plate to provide a bearing for the wedges used between the mold and the frame. A central hole in the plate permits an oil-sand pouring cup to be pasted in place over the sprue.

Stacks are poured from 800-lb covered ladles suspended from either of two overhead electric bridge cranes. When the night gang shakes out, the same cranes are used to put an entire stack, minus bottom board, on the mechanical shakeout.

Each Sprue Is Struck

Shakeout starts with removal of the clamping frame. Using a sledge, a member of the night gang strikes each sprue, driving it downward in the stack and breaking the thin gates at their point of contact with the castings. A cradle which fits around three sides of a stack is used to hoist each stack onto the shakeout. Sand goes through the grate; castings work their way down the inclined deck into a 4-wheel hand truck. Sprues are removed by hand and piled at one side of the shakeout for return to scrap storage.

Molding equipment used in the rest of the foundry includes jolt-squeeze, jolt-rollover-draw, and jolt-strip machines. The latter two types of equipment are often paired in the production of drags and copes, respectively. In addition, a considerable number of jolt-rollover-draw drags are closed with cover cores seated flush with the top of the drag and clamped in place. Many such jobs are complex boxes for dustproof and/or explosion-proof electrical controls. The cover cores simplify a difficut molding job which would otherwise require deep pockets of sand extending below the parting line.

Foundry Superintendent Ed Bornfleth finds that through the use of cover cores, production has been increased by 50 per cent over what could be done with available molding equipment. Ample core room capacity is available and cost of a cover core runs about the same as the cost of a cope with present facilities. Cost of pattern equipment, which would run disproportionately high on the short-run jobs, is reduced.

Australian Branch of I.B.F. Holds First Annual Convention

THE Victorian Division of the Institute of British Foundrymen, Australian Branch, held its first annual convention at Melbourne on November 12-14, 1953. The group was until recently affiliated as the Victorian Division of the Institute of Australian Foundrymen.

The three-day meeting consisted of five sessions, four of which were devoted to the presentation and discussion of technical papers. One session took the form of a full day's visit to foundries in Sunshine and Kyneton.

The conference was very successful and the concluding banquet was well attended, according to W. A. Gibson, Gibson Engineering, Ltd., Sydney. Mr. Gibson has attended several AFS Conventions and Exhibits in the past.

Sanders on Sand Control

Official AFS Exchange Paper was prepared by C. A. Sanders, American Colloid Co., Chicago, and was entitled: "Why Sand Control." The paper was presented by Harold Stevens, Head, Sand Investigation and Research Department, Commonwealth Scientific Industrial Research Organization, who authored an exchange paper at the 1952 AFS Convention at Atlantic City.

Mr. Gibson was chairman of the session at which the exchange paper was presented in Melbourne. The Australian foundrymen received the paper enthusiastically, and were particularly in agreement with Mr. Sanders' point that sand control programs should be the responsibility of a sand technician, instead of being just an added duty of the metallurgist, as is so common in Australia. An animated discussion followed the formal presentation.

Other exchange papers on the program included one from the Institute of Australian Foundrymen, N.S.W. Branch on the subject of metallurgical control in the Australian iron foundry industry. The Institute of British Foundrymen also submitted a paper, reporting on the economic utilization of copper-base alloys.

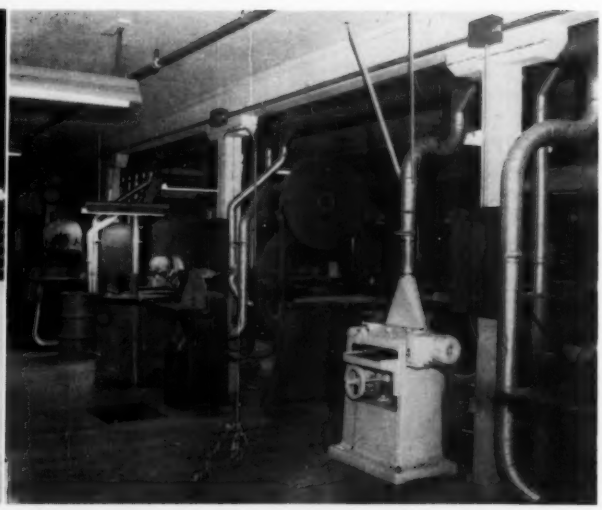
Melbourne University Sessions

The sessions were held in the engineering school of the University of Melbourne, and at Melbourne Technical College's radio school theatre.

The plant visitations were a highspot of the convention, Mr. Gibson reports. The foundrymen were guests at the H. V. McKay Massey Harris works in Sunshine; and at the Ajax Pump Foundry, Kyneton. An entire day was spent on these visits.

Core driers for use in automotive casting are designed at Albion Malleable Iron Co. for production at Chicago plant of Industrial Pattern & Mfg. Co., Inc. Engineering specifications provide maximum rigidity with minimum weight for ease of handling. Provisions for locators and stops for automatic controls are incorporated.

Blow-in Core Driers Used For Close Tolerances



The pattern shop at Industrial Pattern is fully equipped for working in metal or wood. View at left shows part of milling section. At right is a portion of the wood shop, which occupies east half of the Chicago plant.

Combining two established molding methods in one casting operation, aluminum core driers are being produced with such smooth finish as to minimize machining and tooling in cavities. Process uses conventional green sand molding for cope and cheek, permanent mold for drag.

■ The extremely close dimensional tolerances required for coring in present casting operations have resulted in constantly improved methods of core production. Finish allowances on castings must be held to a minimum and casting locating points kept in true relationship to other important dimensions.

Since foundry and machine shop tooling must be coordinated to maintain full machining efficiency, the trend is toward more and more accuracy in pattern and core requirements. One of the requisites for making a casting that machines true to its "as cast" dimensions is a perfect core.

Industrial Pattern & Manufacturing Co., Inc., of Chicago, owned and managed by Harry J. Jacobson, is casting blow-in driers and core boxes from an aluminum alloy, adhering to dimensions of ± 0.003 in., within 12 in. Cavity match can be held within ± 0.001 in. by Jacobson's process, which provides a mirror-like finish in the cavities, without hand finishing or tooling of any kind.

Permanent Steel Mandrel

The cope and cheek are rammed in green sand, using patterns made in Jacobson's plant. The sand mold sections are fitted over a permanent mold steel mandrel that is used as the drag section of the mold. The permanent steel drag allows duplication in quantity of core driers of irregular, contoured shapes at comparatively low cost. The mandrel is a dimensional master and can be utilized for producing an almost unlimited quantity of core boxes or driers.

Industrial Pattern operates a small aluminum foundry in conjunction with its pattern shop, casting driers and core boxes from a special alloy. Metal is melted in a 600-lb, dip-type, oil-fired furnace and transferred into hand ladles for pour off.

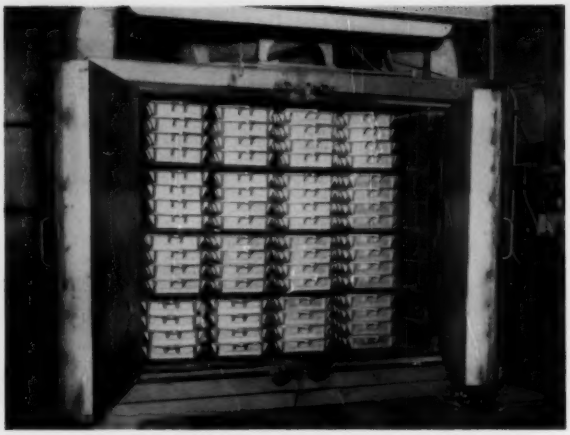
Employing 40 patternmakers in a north side Chicago plant of 14,000 sq ft, Industrial Pattern has been operating since 1937, and now produces both metal and wood patterns, core boxes and driers for automotive, aircraft, agricultural, and valve-and-fitting applications. Although a complete wood-working shop is available, the plant has tended increasingly toward metal in its pattern work.

Typical of Jacobson's operations in the automotive casting field are the intricate core driers for differential carriers he produces for use by Albion Malleable Iron Co. of Albion, Mich. The driers are the blow-in type and have proved particularly successful in holding

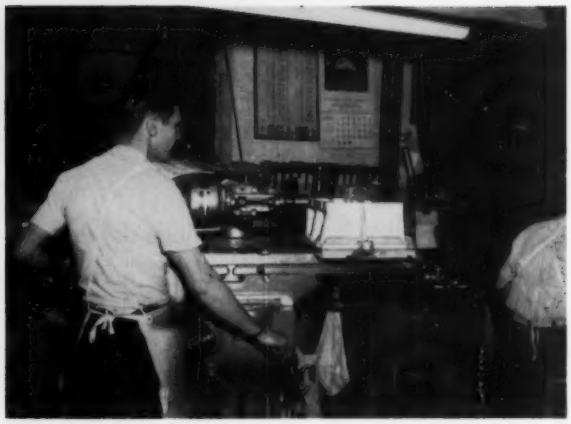
Pilot model of blow-in core drier, made at Industrial Pattern, is returned to Albion where it is checked for conformity. Dimensions are held to 0.010 in.

Permanent mold drag is shown at right, ready for use in casting driers. Cheek (left) and cope are made by conventional molding methods, using special flasks.

Casting shown just as it has been removed and shaken out. The permanent mold drag (mandrel) has been replaced and is ready for next core drier casting.



Oven loaded and ready for annealing of batch of core driers used at Albion Malleable. Process removes growth and strain from blow-in type boxes.



Worker is shown machining side pads used for locating core box in blower. Pads are on two side rails (cast on drier) and at rear end of the box.

true dimensions on large, bulky cores, which are likely to sag when baked in roll-in driers. A substantial production increase has also resulted.

After the engineering drawings and specifications have been completed at the Albion plant, Industrial Pattern makes a pilot model that is returned to Albion for final dimensional checking. In production after approval of the pilot, the cheek and cope are made by conventional molding methods, using special flasks with bars which are removed through the side of the flask after the casting has been poured.

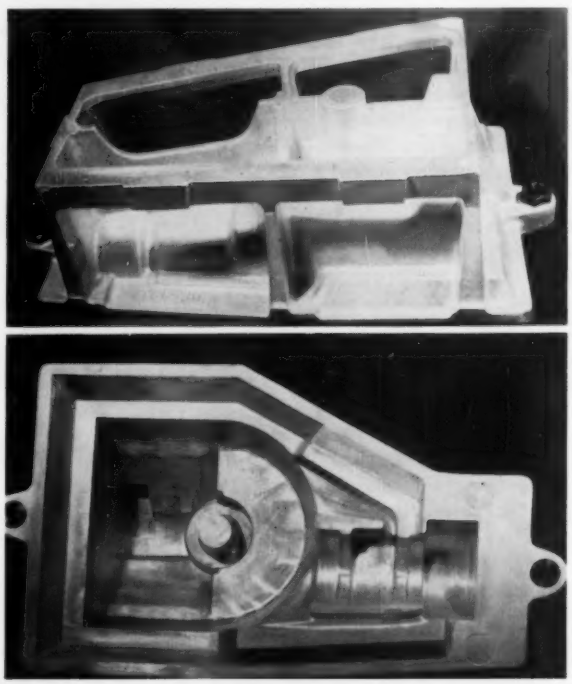
Invert Drag for Shakeout

After the molds have been poured off and the casting has cooled, the cheek and cope are removed and the remaining sand is shaken out by inverting the drag. Knockout pins are used for loosening the casting from the permanent mold drag.

Gates and risers are next removed and the casting is ground as required. Following the grinding operations, Industrial Pattern anneals its core driers in a specially-built oven. An automatic timer on the oven brings the temperature to 650 F, holds it there for three hours, then automatically turns off the heat. Annealing has the double function of reducing growth by 90 per cent and relieving stresses.

When annealing has been completed, the mating face is trued-up to a flat plane on a special fixture, which is also used for machining all driers to a predetermined over-all height. Two side pads are cast on the drier side rails, and one also on the rear end. The latter pad is used in core production to actuate a switch on the blower machine to prevent it from closing unless the pins and bushings are in perfect alignment.

Albion Malleable Iron Co. uses the Industrial Pattern driers in making cores for differential carriers that are cast for the manufacturers of eight different automobiles. Designed and engineered at Albion to provide maximum strength at minimum weight, the driers improve core handling and removal after baking. The cores are blown in semi-automatic machines at a rate of about 170 per hour. A combination of lake sand, western bentonite, water, and core oil is



View of back (above) and cavity sides of blow-in drier made for differential housing at Industrial Pattern. Drier requires no machining or hand tooling in cavity.

mixed and it is then blown at a pressure of 100 psi.

Cores are produced in two shifts at Albion in order to service one-shift foundry operation. The core room is stocked with a bank of baked cores sufficient to supply the foundry for about six hours under average operating conditions.

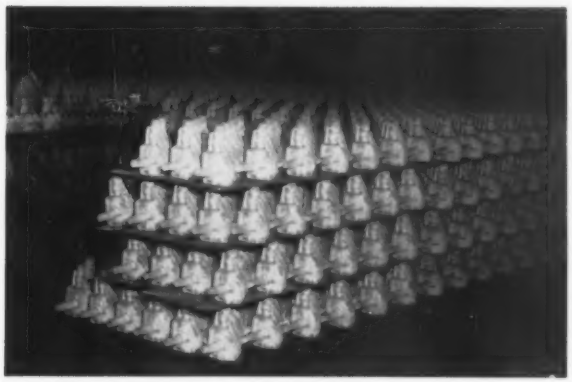
The cores are set in the drag molds by hand, with two carriers and two cases being made in each mold. The carrier is cast on end, the pinion in the drag. Molds are assembled and poured on power conveyors, at rate of about 1350 per 8-hour shift.

After shakeout, annealing, blasting, and grinding, the castings are loaded into semi-trailers inside the plant and delivered directly by truck transportation.

Blow-in Driers

At Albion plant, cores are made in semi-automatic blower. Photo shows core drier about to be placed in position to blow, and a completed core at right.

Albion also uses roll-in driers for other carrier cores. Production rate is lower than with blow-in type because of necessity for additional operations.



Cores are produced in two shifts to service one-shift foundry operation. A bank sufficient to run foundry about six hours is maintained in core room.

The carriers are produced and cast on end, with the pinion in the drag. Two carriers and two cases are made in each mold. Cores are set by hand.

After shakeout, blasting and annealing, carriers and cases are loaded by lift truck directly into trailers. Several thousand units are shipped daily at Albion.

Cooperative Safety Program Produces Outstanding Record

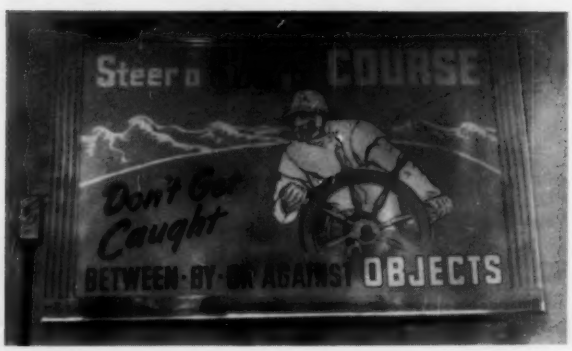
In six years, Eaton Manufacturing Company's Foundry Division reduced its accident frequency rate by more than 46 per cent, and lowered the severity rate at its Vassar, Mich. plant by 98 per cent.

The frequency rate stood at 33.30 in 1947, had dropped to 14.78 in 1952, while the severity factor had plummeted to .08 from a 1947 high of 4.33.

This record contrasts with the 1952 national average frequency rate for all gray-iron and malleable foundries of 31.07, and the national average severity rate for all foundries of 1.05.

The foundry division was recognized as having shown the greatest improvement of Eaton's 12 divisions during the past five years. National Safety Council awards for outstanding achievement in reducing the frequency of disabling injuries have been presented to the division in four of the last five years.

Figures for the first eight months of 1953 indicate that both records should be surpassed, with a frequency rate of 8.6 and a severity figure of .03. Gains in safety have also been reflected in costs, which have dropped from $1.59 per one hundred man hours worked in 1947, to 37¢ per one hundred man hours in 1952. The first half of 1953 shows a further reduction to 21¢ per one hundred man hours worked.



Electrically operated safety sign used in employee clockroom. Changed every two weeks, sign carries safety slogans and messages over signature of general manager.

This outstanding record is the result of a painstaking effort on the part of Eaton staff officials, under the direction of the foundry division's general manager, Edward C. Hoenicke, and company and division supervisory personnel. Such team work was essential in a plant with a total floor area of just under 166,000 sq ft and producing permanent mold gray iron castings in intricately cored designs and simple shapes weighing up to 18 lb. Major markets for the output are manufacturers of automobiles, machine tools, air conditioning units and refrigerators, washing machines, electric appliances, business machines, hydraulic equipment, and others.

Eaton safety officials work on the premise that 10 per cent of all industrial accidents are caused by unsafe conditions and 90 per cent by unsafe working habits. Consequently, a major part of the safety campaign has been directed at employee education, effective supervision, and daily contact between supervisors and employees. Systematic reports are also made to personnel regarding all safety activities.

Lack of a coordinated and definitive safety program has been found to be a major cause of accidents, other than those resulting from personnel failure. Other causes include inadequate electrical equipment, poor illumination, inadequate ventilation, and lack of modern handling equipment.

Poor housekeeping, improper storage, and overcrowded conditions can contribute to heavy frequency and severity rates, according to Eaton experience. Increased employment also causes more exposure to accidents, as do new jobs, which require more training and subsequent follow-up.

Typical Accidents

In an effort to determine where the chief causes of accidents lay, the Eaton staff made a continuous study of their foundry reports. Causes were analyzed in order to devise remedial measures. Taken at random, some of the specific non-lost-time accidents were: splashing iron (burned buttocks), dropped ladle (contusion to thigh), stepping on scrap (sprained ankle), flying particles (cut eye), improper load pushing

Safety devices and equipment used for protection of employees in Eaton foundry division plant at Vassar, Mich. 1. Salt tablet dispenser 2. Dust hood 3. Salt tablets 4. Finger guard 5. Goggle anti-fog compound 6. Respirator filter 7. Ear plugs 8. Apron 9. Face shield 10. Toe guards 11. Safety goggle with nosepiece 12. Dust respirator 13. Chemical and fumes respirator 14. Women's safety shoes 15. Men's safety shoes 16. Visitor's goggles 17. Wide-angle cover goggles 18. Spectacle goggles with side shields 19. Safety hat 20. Visor goggle 21. Cover goggles 22. Dust respirator 23. Plastic sleeves 24. Fire resistant leggings 25. Plastic goggle 26. Cup goggles 27. Plastic goggle 28. Cup goggles 29. Wide-angle cover goggles 30. Rubber gloves 31. Fire resistant sleeves 32. Snap-on safety lenses 33. Welder's goggles 34. Asbestos mittens 35. Grinder's belt.

(back strain), hooked-out casting (burned neck and arms), snag grinding (eye injury), falling material (smashed finger and toes).

Some typical lost-time accidents and the resulting injuries were: slipping and falling against machine (contusion to hip), splashing metal (burned foot), struck on machine (cut knee), flying particle (loss of eye), falling bag (fractured finger), falling casting (fractured toe), dropped mold (fractured toe).

Of the injuries suffered by plant personnel, 60-70 per cent were eye accidents, probably because of the inherent nature of foundry operations. Falling loads, improper storage, bad housekeeping, and faulty handling caused many mishaps also, however. Detailed analyses of this type were vital in aiding management to channel their efforts in safety.

In computing lost-time hours, standard time charges of the American Standards Association were used. These charges range from 6000 days for a death or permanent disability, down to loss of digits or less serious accidents.

Non-lost-time injuries cover dispensary treatment, or the loss of work only from the time of the accident to the start of the employee's regular shift, if he returned to work at that time. If, however, part of a finger is lost, yet the employee returns in time for his next shift (which has happened), a mandatory time charge for permanent partial disability would be assessed against the frequency and severity rates, in accordance with A.S.A. procedure.

Planning the Campaign

Success at Eaton has been based almost entirely on a program of education and enforcement, in addition to modernization of facilities, correction and provisions for proper storage and housekeeping methods, introduction of modern handling equipment, adequate and proper lighting, and functional painting in pleasing colors.

First step was the activation of an effective chain of command. With respect to education, responsibility begins with the company's industrial relations staff. From there, it descends through the general manager, to the foundry's safety director, the factory manager of the foundry division, through his 40 supervisors, and then to the workman. Regarding enforcement, however, this chain does not include the industrial relations personnel, but begins instead with the factory manager.

A manual of safety regulations, developed by staff personnel, was compiled, including latest data on safety, dispensary operations, and compensation pro-

Registered nurse and patrolman simulate emergency conditions in practice session on resuscitator.

Foreman explains safety guards on end grinder to employee. Operating and safety precautions are reviewed.

cedures. It details existing laws and contains standard company and state forms.

The foundry division's safety director adapts from the manual those regulations most applicable to his operating conditions and personnel. While it is the duty of the staff office to visit each division of the company twice a year to inspect the facilities, the primary responsibility rests with the foundry for the day-to-day operation which is the key to a successful program.

Foundry Safety Program

The safety director of the foundry division holds frequent meetings with all supervisory personnel, during which time problems are aired and new regulations are stressed. At these meetings, information pertaining to all hazardous chemicals, materials or gases, used by the division are discussed. These materials are detailed according to their explosive limits, flash points, permissible allowable concentrations, hazardous properties, treatments and antidotes, storage and handling procedures, etc. Information sheets developed under the direction of Eaton staff personnel are released to all divisions in sufficient number to equip all necessary personnel (supervision, nurses, plant protection personnel, etc.). Such information as protective clothing instruction, safe usable practices, and the like, is also included.

During these meetings, the safety director also exhibits the latest safety films and effective visual aids. He also acquaints supervisory personnel with all current division accident and compensation rates and other facts, stressing their current records, the record of the foundry vs. other Eaton divisions, and other foundries, as well as the industry as a whole.

Each month, actual review demonstrations are given on the use of mechanical resuscitation. Even those thoroughly experienced in such techniques receive "brush-up" instruction monthly. This refresher course is a must on safety program agenda.

In addition to basic safety instruction, supervisors are "briefed" on safe handling techniques, improved storage and housekeeping practices, and all other general plant activities, which, if effectively administered, contribute to over-all safety.

Hiring Indoctrination

New employee indoctrination is a specified activity in the hiring procedure. This is accomplished by first sending the employee for a complete physical examination including x-ray. Following his paper work in the employment office, he meets with the safety director, who explains in detail the safety program of the company; sells the employee his safety shoes; fits him with the correct type of eye protection depending on his job; rules and regulations are explained; safety booklets are given to him; and the procedure for obtaining first aid is explained. Here the employee can ask questions and learn to know the safety director. The employee's supervisor then explains the specific safety problems or hazards in his particular department. Here, the foreman-employee relationship gets off to a good start.

In the first aid dispensary, registered nurses are a vital link in the over-all program because of their constant counseling and training program for employees on health problems. They promote the sale of safety shoes, keep goggles repaired, and offer many personal services which result in excellent morale among employees. All records and data are kept on a daily basis in first aid by the nurses, and they ascertain through follow-up that employees and supervisors complete such forms as accident investigation, etc.

Every lost-time accident is case numbered and a special report on it is published immediately by the safety department and all supervision, service departments and staff members receive a copy. The report not only details the case, but offers remedial measures based on investigation. These reports immediately point-up the hazard at the time of occurrence.

A monthly injury report is published in three sections, recording the total plant performance, a breakdown of departmental cost, and a specific injury compilation. The report shows performance, as compared to an established standard of operations for the month and year to date, as well as for the previous year.

Annually, the safety department compiles a depart-

This Eaton foundry safety policy committee discusses policy decisions. From left: A. J. Zahn, safety director; R. T. Peters, personnel director; P. W. Olson, resident manager; S. D. Tyler, assistant general manager; and Fred Brown, personnel assistant. Group establishes policy and changes in over-all safety program from administrative viewpoint.

mental breakdown report on frequency, severity, and cost of accidents giving pertinent comments on performance, and constructive criticism for potential savings and alleviation of human suffering.

Good housekeeping inspection tours by the safety committee are made for the purpose of monthly meeting discussions and the supervisor is referred to certain items as a service by the safety director. Minutes of all safety committee meetings are published and distributed to all supervision, service departments and staff.

A nationally-circulated magazine is subscribed for by the company, and mailed to each supervisor's home address. Fire reports are written and published for all supervision, with pertinent data and recommendations. The safety director actively participates in area safety councils and national safety organizations. The engineering and maintenance departments are constantly working along with the safety department, using as their theme "Design Safety In and Accidents Out."

Bi-annually the entire plant personnel is X-rayed, with a definite follow-up program conducted by the safety department on each case.

Personal Contact

The benefits from monthly meetings are relayed from supervisors to workmen, largely by personal contact. Supervisors stress the humanitarian angle—lost hours are not made up by compensation claims, lost hours mean loss of revenue to the workman and his family, loss of buying power, etc. This approach is a perfectly honest one and most effective because it hits the workman at the most vital point. Charts and displays on losses are used in the plant for employee education on this subject.

In addition to personal contact by supervisors, data sheets are posted on bulletin boards. The division displayed posters and bulletins purchased from the National Safety Council. The company house organ, The Eaton News, is also used to disseminate safety knowledge. Each issue carries an insert concerning the local division news.

A two-way program of safety communication is constantly kept open, based on the foreman-employee relationship that was carefully developed when the worker joined the department. The regular plant suggestion system is also used for ideas that will promote safe practices. Several valuable suggestions have resulted.

Together with this program of education and enforcement, the foundry division has made rapid strides in the installation of modern handling equipment, and the introduction of advanced handling techniques.

For example, mechanical handling equipment installed as part of the over-all modernization program includes: industrial trucks, conveyors, overhead cranes, lifts and hoists, monorail systems, pneumatic sand handling system with automatic distribution. Manually-operated handling equipment added includes: hand trucks, trailers, and specially-designed hoppers for casting handling at each operation.

In addition to modern handling equipment, storage facilities were greatly improved. Together with the designation of specific storage locations, such equipment as pallets, metal skid bins, racks, and other storage equipment were purchased.

The foundry's layout was modernized and streamlined, and straight-line flow was instituted wherever possible. Routing of in-process goods was studied and individual moves shortened.

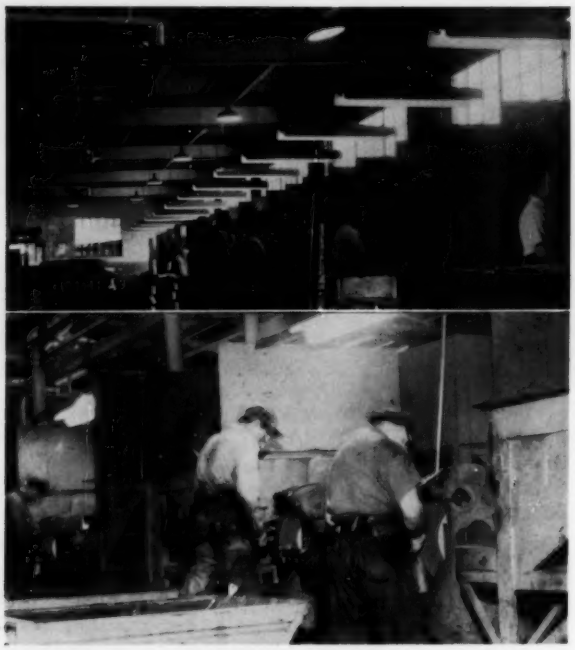
In the foundry proper, a large overhead duct brings in cool fresh air from the north end of the plant, drawn in by a large fan. It is distributed to each iron pourer and operator by down pipes. The worker can regulate the amount of air according to his needs, by means of a damper arrangement in each down pipe, eliminating the use of individual blowers (man coolers) that did nothing but agitate the hot air around the worker and blow particles of iron and dust into his eyes, despite goggles.

Material or equipment not in use is not allowed to remain in the plant. A central disposal area has been set up for all rubbish, broken and worn-out grinding wheels, scrap sheet metal, and all other useless material that accumulates so quickly around a foundry. Equipment that can be used again is repaired and stored in the warehouse. If it cannot be repaired, it is scrapped immediately.

Illumination Studied

Lighting of the foundry was studied and improved. It was found to be an important factor, since correct lighting greatly reduces accidents.

In order to reduce sunblinding of shop truck drivers, as well as in areas of critical operations, a new glare-reducing and heat-resisting glass pane is being used in various sections of the plant. This eliminates painting



(Above) Modern overhead lighting units are provided for individual workers in the inspection department. (Below) Good lighting levels are provided for snag grinding operations, with hoppers for stock at close range. Note dust-arresting pipes, goggles, belts.

of glass and gives a neat, uniform appearance, in addition to the elimination of the blinding hazard.

Since the permanent molding process as used by Eaton's foundry division demands the use of acetylene gas, the generating of such gas creates certain safety problems, which require the utmost in maintenance precautions and safe handling. For these reasons, the generators are housed in a separate building far enough from the plant proper to insure safety in case of an explosion. Non-sparking maintenance tools are the only type allowed in this building. A specially-designed tank-type truck is used exclusively for the disposal of sludge from acetylene generators. All gas lines have pressure regulating valves to insure proper operation. Water seals are used in all gas lines to prevent "flash backs" to the acetylene generating building. On the outlet end of the gas lines "bursting discs" vented to the atmosphere are provided to prevent explosion. On each gas line, emergency shut-off valves are installed and properly marked with appropriate signs. They cut off the gas supply to the foundry proper.

Maximum Safety

Inside the generator building, air hoists and brass chains are also used for chain falls where required. The generating building itself is constructed with an explosion-type roof. An employee-training program for operators is in constant process, whereby at least three trained men on each shift are available. With this type of engineering and construction, as well as training in safety, the company feels that adequate measures have been taken to insure not only an efficient system, but one that is also safe in every respect.

The most modern of safety equipment is provided for the entire plant. All workmen are supplied with goggles free of charge. Here again, constant education and supervision are vital to make sure that they are used. Safety shoes are made available at cost through the dispensary and may be purchased via payroll deduction. Again, education and supervision is vital to the success of this phase of the program. Gloves, mitts, leggings, and other equipment necessary for safe operations are furnished without charge. Machine guards, while only a minor factor in foundry operations, are required on grinders and in the tool room. Prescription lens are provided on a share-the-cost basis for those who desire them. A constant program of refresher training on equipment is maintained for protection of the employee.

Clean Aisleways

An important contributing factor to low frequency and severity rates has been the constant insistence on cleanly swept aisleways, both inside and outside of the plant. Aisleways are marked permanently with painted, steel-beam, protective barriers, which serve a dual purpose in that they mark the aisles as well as protect employees from "on the floor" traffic. Along with the aisle program is the restriction on stacking skips in designated areas. Some areas are limited to skips being stacked one, two, or three high.

Such items as dust collectors for every operation are in constant use in all sections of the plant. Sludge is removed by elevator for disposal. This procedure eliminates dirt and contamination possibilities.

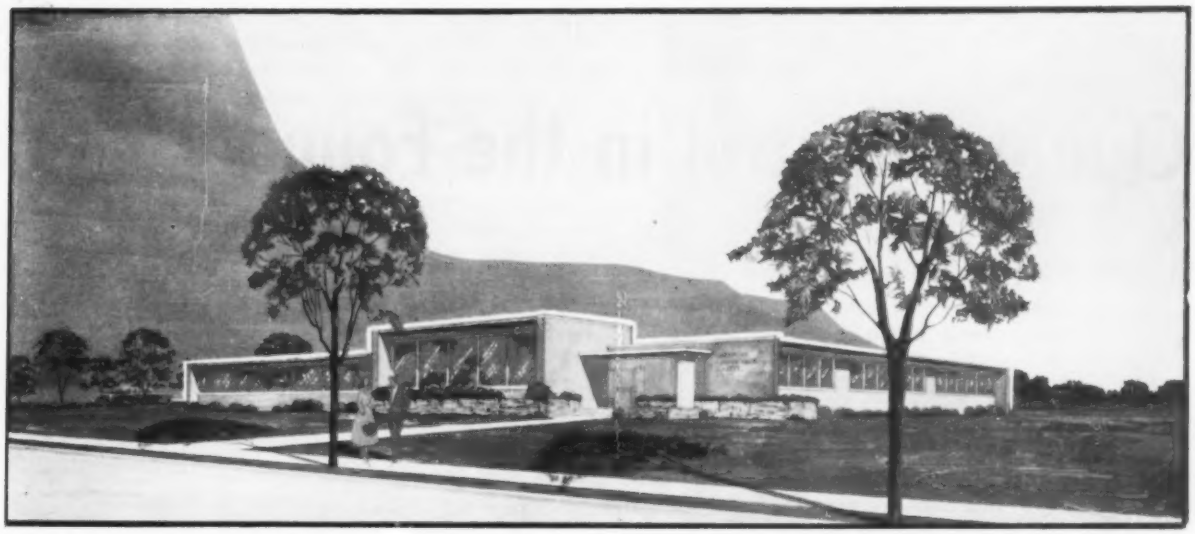
All systems such as heating boilers and air compressors have automatic safety controls for shutoff to prevent explosions and danger of overloading.

Not Just Theory

It can be said in conclusion that the safety program at Eaton's foundry division is not just a theoretical approach, but a living everyday operation for which standards are established and goals and low cost must be realized. Eaton officials do not look upon their safety department as a necessary evil. A safety program, properly and sincerely administered, can produce profits proportionately as do any of the production departments of the business, as well as contribute probably to the largest degree in the alleviation of human suffering, a management obligation in any business.

Top management and all levels down to and including the individual workman at the foundry division are cognizant of the benefits derived from a well-run, cooperative effort in health and safety, and it is this humanitarian viewpoint that insures the success and efficient operation of the safety program.

Based on the theory that health and safety is a necessary and integral part of business, just as is production, and that each and every member of supervision is responsible for his own safety record, the gospel of safety soon becomes habit. With good habits once formed, low frequency, low severity, low costs, and most of all, a minimum of human suffering, become a reality on a continuing basis.



Construction Proceeding As Fund Reaches $180,000

OFFICIALS and Directors of American Foundrymen's Society gathered at the site of the new headquarters building and Foundry Technical Center at Des Plaines, Ill., on November 17, 1953 for the official groundbreaking ceremony.

Participating were AFS President C. L. Carter; Vice-President F. J. Dost; Secretary-Treasurer W. W. Maloney; Housing Committee Chairman R. J. Teetor; and Owner's Representative F. C. Riecks. Mayor K. G. Meyer of the city of Des Plaines, Ill., and foundrymen from the Chicago area witnessed the proceedings.

Meanwhile, work is actively under way and was slightly ahead of schedule in mid-December, favored by good weather. All excavating had been finished and foundation walls and footings were in place by December 10.

Fund Solicitation

The building fund solicitation had reached a total of $180,000 as construction was in progress. The following additional contributions have been made since November 1. (Asterisk indicates addition to an original pledge.)

Appleton Electric Co., Foundry Div., South Milwaukee, Wis.

***Albion Malleable Iron Co., Albion, Mich.**

Arlington Bronze & Aluminum Corp., Baltimore, Md.

Axelson Mfg. Co., Div. Pressed Steel Car Co., Los, Angeles

continued on page 90

R. J. Teetor, Chairman AFS Housing Committee, handles shovel at groundbreaking ceremony on November 17, 1953. Others, from left: Dean F. W. Trezise, University of Illinois, Chicago; L. P. Robinson, Archer-Daniels-Midland Co., Cleveland, a past Director of AFS; W. W. Maloney, AFS Secretary-Treasurer; D. J. Hayes (rear), AFS staff; AFS President C. L. Carter; W. N. Davis (rear), AFS staff; F. C. Riecks, AFS Owner's Representative, Ford Motor Co., Detroit; Prof. R. W. Schroeder (rear), University of Illinois, Chicago; AFS Vice-President F. J. Dost; Mayor Kenneth G. Meyer of Des Plaines, Ill.; W. H. McCarthy, Giffels and Vallet, Chicago and Detroit; and C. E. Hoyt, retired AFS Executive Vice-President.

Quality Control in the Foundry

JAMES M. BARABEE / *Inspection Methods Research Engineer, International Harvester Co.*

As rate and complexity of castings production increases, more and more foundries turn to statistical quality control. Examples of what the author's company is doing in this field are reported here in a paper based on a presentation at the 1953 annual convention of the American Society for Quality Control.

J. M. Barabee

■ Many foundries keep a number of variables under some form of control, statistical or otherwise. In most cases where a continued attempt has been made to use the resultant figures to control casting quality, there has been a definite reduction in foundry scrap and rework. One company (Carl R. Loper, James D. Claffey, and Frank L. Waldenmeyer, "Castings with a Pedigree," AMERICAN FOUNDRYMAN, vol. 23, no. 2, Feb. 1953, pp. 36-38) has even gone so far as to furnish a complete operational history with each casting produced.

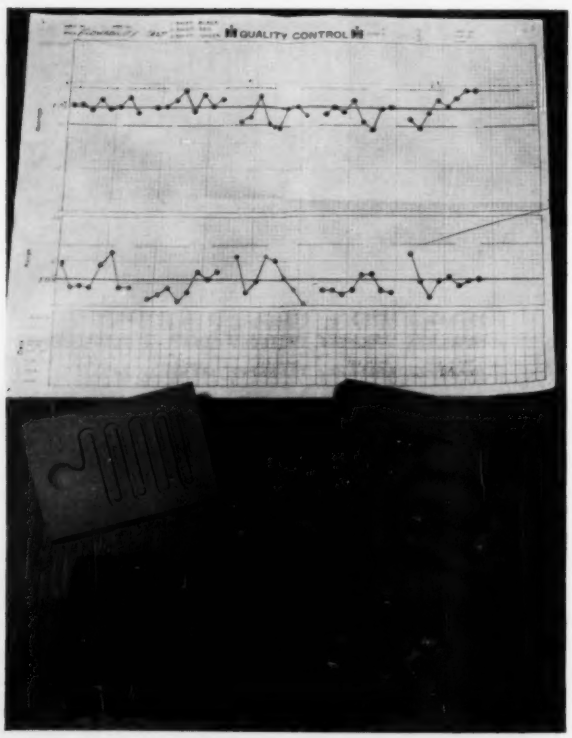


Fig. 1—New metal flowability test developed by International Harvester Co. has proved an important aid in quality control of cupola metal.

The manner in which preliminary preparation is handled by the foundry and engineering departments can often make the difference in whether or not a casting can be produced satisfactorily—at a quality consistent with economy. Investigation should be made on the original blueprint (preferably a casting print) referring to the maintenance of dimensional characteristics as set by engineering and difficulty in core practice. Iron specifications, allowance and locating points for machining, etc., should also be closely analyzed. One International Harvester plant is even planning to set up an experimental area where not only sample castings can be made, but also a study can be conducted as to the most efficient setup for molding practice.

Control of raw materials can also be studied for without consistency or definite knowledge of inconsistency, little can be done to isolate or make adjustments for some of the basic causes of casting defects. Items such as sand, pig iron, scrap, chaplets, lumber, shot, etc., should all be sampled to determine conformity to desired specifications. Additional checks can be made in layout of new or repaired pattern equipment, driers, and chills even prior to the preparation of sample castings or cores.

Lost in Figures

For years IH foundries have kept records of casting production, scrap produced, molding efficiency, etc., but the effectiveness of these records was often lost in the maze of figures. The use of simple charts has provided a means by which these figures could be presented simply and effectively even to the most unskilled personnel. Trends can be readily observed and sudden fluctuations stand out clearly. In cases where only certain jobs were originally plotted, the tendency has been for the other operators themselves to ask for further installation on their particular operation. A look at some of the foundry departments shows that it is possible to add some form of effective chart control where previously numerical records were not used to best advantage.

An $\overline{X}R$ chart or average and range chart is one on which the averages and ranges of small samples are plotted. By observing these values and their relations

to statistical limits which can be calculated, a rather complete picture can be obtained of the level (X) and the consistency of the process (R). The relation of each set of plottings to the limits determines the process capabilities, and also whether there is any indication of an "assignable cause" tending to make the plottings fall outside the normal variation limits. This type of chart is used where measurements of characteristics are taken, and its value lies in its ability to show variation in processing rather than at final inspection where generally no corrective action is possible.

Where characteristics that cannot be measured are being checked, (such as casting defects like blows, scabs, etc.) a per cent defective chart or P chart is used. Based again on subgroups, this chart records the variation of per cent defectives found in each one and relates them to control limits similar to those mentioned in the XR chart.

Proper Temperature

Aside from the usual analysis checks plotted during melt down, operational checks can also prove very effective in keeping the metal at proper temperature and analysis. Chill tests can be correlated against ferrochromium or ferrosilicon additions where samples are taken from successive ladles and the resultant averages of chill readings can determine the amount of inoculation in the ladles. A new type of flowability test (Fig. 1) made from cores is being used, in which length of flow in the channel is very sensitive to changes in analysis and also in temperature. Readings are plotted on an $\overline{X}R$ chart, and they give a visual indication of this variation in temperature and analysis.

One charging operation on which $\overline{X}R$ charts are applicable is on the cupola. Quite often a charging operator will attempt to level out one underweight charge by overcharging the following bucket, resulting in extreme variation in cupola operation throughout the heat. By setting charge standards and measuring the weight over or under the specified figure, similar to a sand mixer charging operation, the variation can be easily measured and steps taken toward its correction.

A recent innovation has been the use of $\overline{X}R$ charts for job qualification on the pouring stations. A standard pouring time was set for each type of mold on the line based on defects and scrapped castings over a long period. Each hour the amount of time in 100ths of a minute over or under each mold standard time was measured and averaged on five molds and plotted on an $\overline{X}R$ chart. This gave an indication of whether proper pouring practice, especially in keeping the sprue properly filled, was being observed by the iron pourers on the unit.

Chart Record Qualifies

A new man desiring to fill an iron pouring classification had his performance similarly plotted and either qualified or was disqualified after an allotted time on the basis of the $\overline{X}R$ chart record. He at least had to show that he could equal the record of the man he was trying to replace or else he would be automatically rejected (Fig. 2).

Cold iron was the greatest single factor in defective casting rejection at one of our foundries; and the lack

Fig. 2—Pouring time and metal temperature are both held under close statistical quality control in this shop. Pourers are qualified on the basis of their ability to stay close to standard pouring rates.

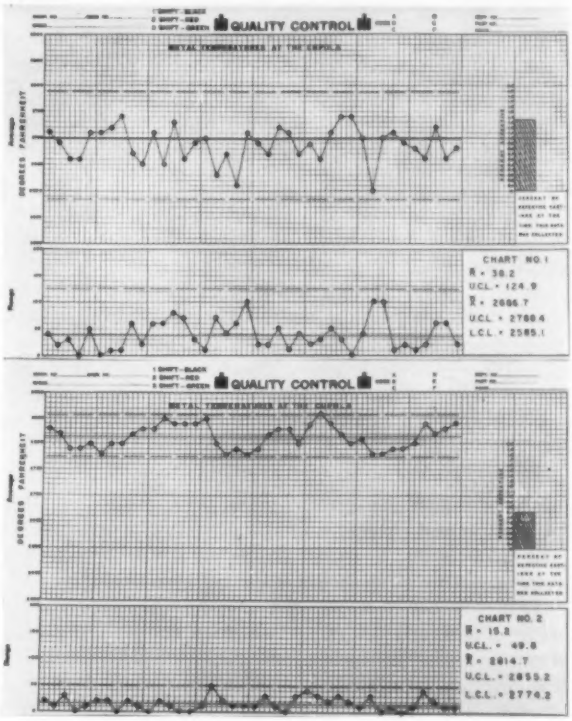


Fig. 3—Metal temperature and scrap record was improved (50 per cent less loss due to cold metal) after better melting and handling techniques were introduced. Chart 1 was made before improvement, Chart 2 after.

of superheating devices or a holding ladle necessitated tapping at the highest possible temperature. It was discovered that, although the spout temperature at the cupola was high enough for most jobs, present metal handling from the cupola to the molding floor resulted in too great a drop in temperature. Pyrometer readings plotted on an $\overline{X}R$ chart at the cupola and on the molding floor had proved the necessity for increased metal temperature as well as improved handling procedures to assure constant hot metal (Fig. 3 upper).

Subsequent investigations resulted in a change in type of coke used, a revised schedule of pouring and tapping to allow the cupola to run as continuously as possible, an increase in coke charge, and a relining of all ladles to a reasonable inner diameter which would eliminate the large heat loss during pouring. Figure

Fig. 4—Photo shows series of "process action" notices used by International Harvester in control program. Colored white, yellow, and red, forms contain warning of below-standard performance by foundry personnel. Remedial action is specified where required.

3 (lower) shows that the average cupola temperature was substantially raised and casting loss due to cold metal was cut almost 50 per cent.

When operating any sand mixer, especially where there is no mechanical charging, the use of standard weights in charging the various components is essential. Too often the use of battered containers, "one shovelful," or "one wheelbarrow of" in determining mixes, contributes immediately to inconsistencies in the amount of materials added to the muller. All components should be weighed and added to a sand mixer which has been cleaned at least once a shift. If this practice is not followed in the core room, the coating which clings to the side of the mixer will absorb a substantial portion of the oil that is added.

It is possible to check the efficiency of charging by using a standard $\overline{X}R$ chart on which the weight of material charged either over or under the standard amount can be plotted at various intervals. This type of chart can quickly show whether the operator is following specifications or mixing at his own discretion.

Mixing time can also be measured, for it too can make the difference between good and bad mixes. A recording wattmeter can easily be attached to the motor driving the mixer and it quickly indicates changes in motor load on the recording paper.

Records Time and Loading

The proper time for mixing each of the components can be determined in preliminary tests and, from this point on, the meter merely records the time and loading of the motor throughout each of the mixing cycles. The buildup of green strength is also recorded on the paper and this can be calibrated so that the loaded mixer will be emptied by the operator at both the proper time and therefore at satisfactory strength. Thus, although not a true control chart, the running wattmeter record gives some evidence of efficiency of operation in a completely automatic manner.

In the core room itself, both green and dry checks can be made. Some foundries check cores visually in the green state to obtain information as quickly as possible, and then they sample the baked cores upon completion of cleaning and assembly operations for the over-all quality picture. One floor molding foundry checks 25 each of the ten most troublesome cores on the molding floors each morning, and keeps a continuous P chart record of the per cent defective and type of defects found in each group.

Core Rating System

Another foundry uses a core rating system (A. Evans, "Foundry Quality Control," *Industrial Quality Control,* vol. 9, no. 4, January 1953) in which 20 cores twice a day are sampled from critical jobs. A rating of 10 is given for a perfect core, 8 for one with a minor defect, 5 for one with a major defect, and zero for a scrap core. A percentage value is then calculated by dividing the total points by a perfect score of 200 and compared with a previously determined standard, for instance 95 per cent or 180 points out of a possible 200. Any deviation below the standard is recorded on a "Process Action" notice which is issued to the man at fault and his supervisor. A series of three such notices (Fig. 4) which are progressively colored white, yellow, and red is cause for warnings and finally disciplinary action to be taken against the employee.

One specific case illustrating the use of P charts for core checking occurred during an investigation of vent iron in some track idler cores. Poured metal often ran out through the vents and cracks in the core, and an average of 16.5 per cent of the cores were found defective, mostly for cracks, unfilled vent holes, exposed wires, and dip surface flaws. Sample checking of the visual characteristics (Fig. 5) was instituted daily on the complete core assembly and over a period of time, a histogram of the completed charts showed a continual improvement down to the present 3 per cent level (Fig. 6).

A completely automatic moisture metering setup has been installed on one foundry sand system. A mercury tube sensitive to heat and two electrodes sensitive to moisture were placed in the weigh lorry carrying molding sand from the storage bins to the mullers. By measuring the temperature of the return sand and also its moisture, the system automatically calibrates and meters out a prescribed amount of water for that particular sand load into a reservoir above the muller. Once the sand has been dumped into the muller, the water is added immediately. In order to account for extreme variations in temperature and moisture due to nightly or week-end shut downs, a variable manual control of a base amount of water is possible, with the automatic controls taking over above a certain temperature and moisture.

A very short time after the system has been in operation each day, the sand reaches its normal variation pattern and from that point on no changes in base water are necessary and the metering is completely automatic. Not only has the control of moisture content been achieved, but the mulling time has been cut considerably taking quite a load off the operators who were continually pressed to meet the molding requirements.

The use of quality control either as a process control

or acceptance procedure often depends upon a particular foundry layout. A floor molding foundry which only pours off a few hours a day has to rely generally upon a system where castings are checked for defects possibly a day after being poured, and necessary changes in molding practice are made after that time. Control in this case must be based on the over-all charting picture of molder performance since the molder puts up his floor almost completely before pouring off the molds. A check at pouring time is almost useless, for the quality of the unpoured floor is completely unknown. One type of chart that has been of value is an individual molder's P chart (Fig. 7).

In one of the smaller foundries, IH has 70 single and group molders. Each man and group has a separate card mounted on a board near the foundry office. On each card is recorded the per cent of scrap attributable to the molder each day. Being out in plain sight the board shows up the good and bad performances alike, and arouses a sense of competition merely by its presence. Admittedly the charts are not strictly up to date but the continuous story they tell, even when they are two days behind, is forceful. Reduction of scrap was noticed shortly after the board had been mounted and it has awakened a desire for better performance in those molders.

In mechanized shops, sample type inspection is being used at the end of rollaway conveyors or at the end of unit shakeouts. Samples can be taken as often as desired and knowledge of specific defects is evident sometimes within 15 minutes after the castings have been poured. The use once again of an individual P chart is very helpful especially if it is posted near the molder's machine, plotted often, and the defects listed.

Rating systems are also kept, very similar to those already mentioned on core making operations, where molders are penalized for casting defects and rated on their conformity to set a standard. In these instances where results are plotted in the form of rating, the issuance of the colored "Process Action" notices serves to remind the molder of scrap which is his fault and the need for correction of same.

Characteristic Cards Useful

Characteristic cards have proved very useful in preparing jobs for the molding floor. By listing the complete specifications as to flask requirements, chills, chaplets, ramming, previous defects, core setting practice, etc., a job can be reviewed each time it is reinstalled to make sure it is correctly set up. This will prevent the occurrence of defects which might have been eliminated previously, but whose corrective measures were never recorded to help out the next time in case of trouble.

Such items as mold hardness can be controlled accurately by means of $\overline{X}R$ charts. Whether the mold is made by hand, on a jolt-squeeze machine, or a slinger, the $\overline{X}R$ chart serves its purpose in pointing out the variation occurring on that characteristic. Solenoid valves to control "bumping" has been of some help on jolt machines, but alone they cannot entirely cure the problem.

Another example of what can be accomplished by the use of charts was the core setting operation on a

Fig. 5—Checking core assemblies and charting findings reduced defectives from 16.5 per cent to 3 per cent.

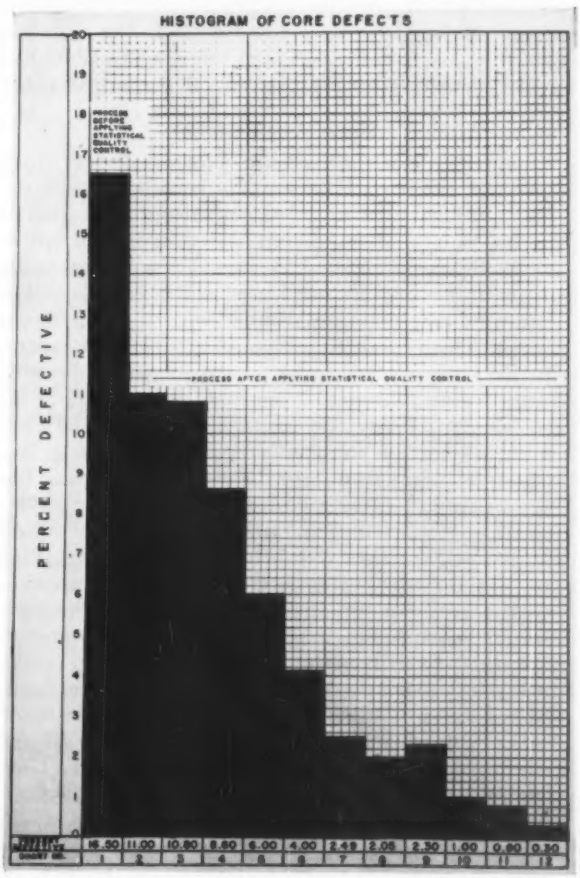


Fig. 6—Per cent defective cores dropped steadily after statistical quality control was applied.

seed boot in one of the company's implement foundries. All machining operations were located from a cored casting surface which had to be held within extremely close tolerances. The molder naturally complained that such a close setting could hardly be kept on a production molding job. Nevertheless, after he was carefully instructed as to setting procedure, he was shown how the cored dimension would be sampled frequently and plotted on an $\overline{X}R$ chart. The chart would show him the tolerance which he was maintain-

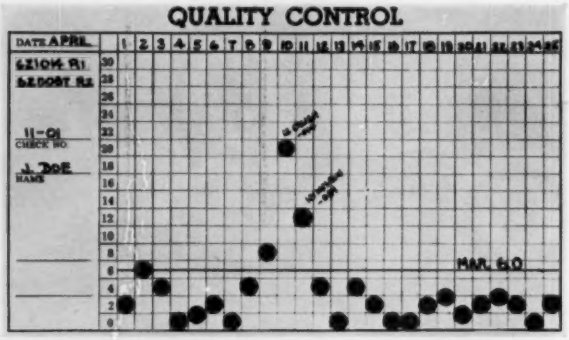


Fig. 7—Simple chart for use in recording individual molder's performance in a floor molding shop. Control in this case must be based on over-all charting picture of molder performance for effective results.

ing and which direction he should move the core if it was off location. After about a week, the man was easily setting cores to the desired specification, had pride in his own ability, and confidence in the chart.

Show Whole Story

Frequency distributions are another device which can show the over-all status of a process at a glance. They are ideal for such items as conformity to analysis specifications and mold hardness distribution where the whole story might be desired rather than a point by point process record. One of the IH Canadian foundries had molding trouble with a small fluted washer which resulted in about 42 per cent scrap. Quality control was applied to the job in the form of frequency distributions represented by histograms on the per cent of defective castings produced from each of the washers on the gate (Fig. 8).

Samples were taken from the molding floor, and the rejections were segregated under the respective washer numbers. It was found that one washer was accounting for as much as 67 per cent of the total rejections. This one washer, together with others causing scrap to a lesser degree, was gradually corrected with the foreman regulating his practice based on information gained from a daily perusal of the charted scrap results and recorded defects. In this manner, the washer scrap was reduced to 3.1 per cent in three weeks.

The use of advanced control techniques in the foundry has been very gradual. A look at the AFS book *Analysis of Casting Defects* shows pictures of defects and a large listing of possible causes, many of which are still hotly disputed throughout the industry. The industry is past the stage of making investigations by trying to hold all elements constant, varying only one at a time to observe its effect. With statistical quality control, the important items can be isolated while observing the variations of all elements during normal operation. Learning to accept these normal variations seems to be most important for they will always exist and it is necessary to set the pattern of operations recognizing that fact.

Correlation is being used frequently by a few quality control engineers on specific investigations. Bore hardness of cylinder blocks versus top deck hardness constituted a large program at Indianapolis (Evans *loc. cit.*). The inoculation of iron on the basis of chill test readings was another.

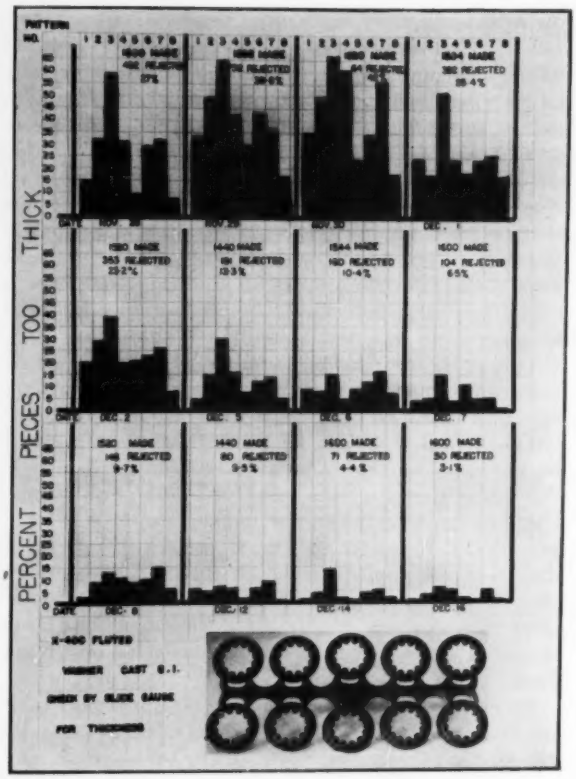


Fig. 8—Complete history of scrap reduction of fluted washers is depicted on this chart. One pattern was found to have caused two-thirds of scrap.

At the company's research foundry in Chicago, advanced studies were made which revised the method of thinking of the whole foundry group. One of the prime results has been recognition of the existence of confidence limits on sets of figures used in the various reports. Many times, comparisons were made and conclusions drawn from too few figures, where the true results might possibly have been far different than they seem. Another investigation involved an analysis of variance in the tensile strength of certain sand and resin mixtures for shell molding. By designing the experiments beforehand, results were obtained in a single week, which otherwise might have taken more than a month if normal procedure had been followed.

Provide Proof of Validity

Admittedly there are not too many places where such investigations are being used. However, their value should not be overlooked. They can often provide definite proof as to the validity of certain practices or theories, they can save time, and they can open new channels for further investigations.

Although most of this material has been concerned with operations in large mechanized foundries, many of the applications can readily be transferred to smaller plants. Quality control has the appeal of being readily adaptable in some form to almost all setups and can be of definite value if correctly used.

Housing Applications Ready For Cleveland Convention

ALL AFS members and exhibitors will receive application forms during January for hotel space during the 1954 Convention and Exhibit, May 8-14.

The Hotel Association of Cleveland has promised foundrymen attending the AFS meetings more bedrooms for 1954 than have been made available in that city at any time in the last ten years.

It is suggested that the application forms be completed as soon as possible after they are received. They should then be sent directly to: AFS Housing Bureau, c/o Cleveland Convention and Tourist Bureau, 511 Terminal Tower Bldg., Cleveland 13, Ohio. Names of hotels available during the Convention will be printed on the application forms, and choices will be indicated thereon. It is particularly important that the forms *not* be sent to the Chicago National AFS Headquarters. Your application will be delayed if that is done, since it will have to be forwarded to Cleveland.

Rising Interest

Meanwhile, foundrymen from all sections of the United States and Canada are showing considerable early interest in the Convention and Exhibit. Inquiries received at Chicago indicate a large attendance at the combined technical meetings and foundry equipment show, which has become one of the most important industrial events of its type in the nation.

Committees of every AFS division are reviewing the technical papers already received for presentation at the Convention. These committees are coordinating their activities in formulating a program of outstanding interest in all phases of the metals casting field: Brass and Bronze, Education, Gray Iron, Light Metals, Malleable, Pattern, Sand, and Steel. In addition, subjects of general interest to foundrymen will be covered.

Supplementing the formal presentation of technical papers, shop courses are being planned by the Sand and Gray Iron divisions.

Tentative Program
58th Annual AFS Convention
Cleveland, May 8-14, 1954

Saturday, May 8, 1954

(Northeastern Ohio Day; admission by invitation only)

9:00 am: Registration opens
9:30 am: Exhibits open

Sunday, May 9, 1954

5:30 pm: **AFS President's Reception**

Monday, May 10, 1954

8:30 am: Registration opens
9:30 am: Exhibits open
10:00 am: **Technical sessions**
Brass and Bronze, Light Metals, Malleable
12 Noon: Light Metals Round Table Luncheon
2:00 pm: **Technical sessions**
Brass and Bronze, Light Metals, Malleable
4:00 pm: **Technical sessions**
Brass and Bronze Shop Course, Light Metals, Malleable Shop Course
5:00 pm: Registration closes
5:30 pm: Exhibits close
8:00 pm: Gray Iron Shop Course
Sand Shop Course

Tuesday, May 11, 1954

8:30 am: Registration opens
9:30 am: Exhibits open
10:00 am: **Technical sessions**
Brass and Bronze, Light Metals, Malleable, Pattern, Time Study & Methods
12 Noon: Round Table Luncheons
Brass and Bronze, Educational, Malleable, Sand
2:00 pm: **Technical sessions**
Dust Control & Ventilation, Educational, Light Metals, Plaster Mold Casting, Time Study & Methods
4:00 pm: **Technical sessions**
Brass and Bronze Shop Course, Dust Control & Ventilation, Educational, Malleable Shop Course, Pattern
6:30 pm: Canadian Dinner
8:00 pm: Gray Iron Shop Course
Sand Shop Course

Wednesday, May 12, 1954

9:00 am: Registration opens
10:00 am: **Annual Business Meeting and Charles Edgar Hoyt Annual Lecture**
12 Noon: Exhibits open
Round Table Luncheons: Gray Iron, Pattern
2:00 pm: **Technical sessions**
Heat Transfer, Plant & Plant Equipment, Refractories, Sand, Steel
4:00 pm: **Technical sessions**
Gray Iron, Heat Transfer, Sand, Safety in the Foundry
7:00 pm: **AFS Annual Banquet**

Thursday, May 13, 1954

8:30 am: Registration opens
9:00 am: **AFS Past Presidents' Breakfast**
10:00 am: **Technical sessions**
Gray Iron, Sand, Steel
12 Noon: Steel Round Table Luncheon
2:00 pm: **Technical sessions**
Air Pollution Control, Foundry Cost, Gray Iron, Refractories, Sand
5:00 pm: **Technical sessions**
Air Pollution Control, Gray Iron, Sand
7:00 pm: **AFS Alumni Dinner**
8:00 pm: Gray Iron Shop Course
Sand Shop Course

Friday, May 14, 1954

8:30 am: Registration opens
9:30 am: Exhibits open
10:00 am: **Technical sessions**
Gray Iron, Sand, Steel
1:00 pm: **Exhibits officially close**

Colorimetric Determination of Acid–Soluble Aluminum in Steel

M. C. STEELE / *Head, Chem. & Met. Dept., Technical College, Wollongong, Australia*

■ Aluminum may occur in certain steels as the oxide, nitride and metallic aluminum. In transformer steels it is desirable to have the "metallic" aluminum (nitrides and metal) below 0.01 per cent. The following method is a means of determining this aluminum.

Procedure

A steel sample of 0.250 grams is weighed and transferred to a 125-ml conical beaker and dissolved in 20 ml 43 per cent perchloric acid. Aluminum oxide and some silica are filtered off and washed with small portions of hot water. The filtrate containing the acid-soluble aluminum is evaporated to $HClO_4$ fumes and fumed for 5 minutes. The precipitates, after fuming, are dissolved in 20 ml 5 per cent HCl, boiled and filtered immediately to remove any remaining silica. The filtrate is evaporated *just* to fumes; 25 ml of hot water are then added.

The solution is then electrolyzed using a mercury cathode, 3 amp, 6 v, for 2 hrs. The cover glasses, electrodes and walls of the electrolysis vessel are washed down and electrolysis continued for half an hour.

The electrolyzed solution is filtered to remove traces of mercury and manganese dioxide into a 125-ml conical beaker. The solution is then evaporated until the remaining salts are just moist and 5 ml water are added to wash the sides of the beaker and to redissolve the moist salts. The solution is then transferred to a clean, marked tube and made up to 20 ml.

To complex any iron ions which may be present, 0.5 ml thioglycollic acid, 1 per cent solution, are added. After complexing, 10 ml of aluminon composite solution are added followed by 5 ml of 1 per cent gelatin solution. The tubes containing the mixture are then placed in a basket in boiling water for 10 min, then progressively cooled for 10 min in air and water to room temperature.

The solution is then diluted to 100 ml in a volumetric flask, and the developed color is measured by an adequate instrument.

Reagents

Perchloric Acid 43 per cent: Dilute 72 per cent perchloric.

Thioglycollic Acid: 1 per cent solution, (1:99).

Author M. C. Steele is shown here working at absorptiometer, in process of concluding a determination of acid-soluble aluminum in a sample of steel.

TABLE 1—CALIBRATION CURVE FOR ALUMINUM 0 TO 0.022 PER CENT

ml Al Solution	Al, Per Cent	Drum Reading	Drum Difference	Difference, Blank & Sample
0.0	0.000	0.820	0.180	0.000
0.5	0.002	0.760	0.240	0.060
1.0	0.004	0.700	0.300	0.120
1.5	0.006	0.635	0.365	0.185
2.5	0.010	0.500	0.500	0.320
3.5	0.014	0.375	0.625	0.445
4.5	0.018	0.245	0.775	0.575
5.5	0.022	0.120	0.880	0.700

TABLE 2—FOR ALUMINUM 0 TO 0.0020 PER CENT

ml Al Solution	Al, Per Cent	Drum Reading	Difference, Blank & Sample
0.00	0.0000	0.820	0.000
0.10	0.0004	0.807	0.013
0.20	0.0008	0.795	0.025
0.30	0.0012	0.785	0.035
0.40	0.0016	0.770	0.050
0.50	0.0020	0.758	0.062

Aluminon Composite: Equal amounts of acetate buffer solution and aluminon solution.

Aluminon Solution: 0.5 grams ammonium aurintri-

carboxylate dissolved in water, 5 ml of 1g/l benzoic acid in methanol added, and the solution made up to 500 ml. (Allow to stand three days before using.)

Acetate Buffer Solution: Dissolve approximately 670g/l and adjust the pH to 5.25-5.35 by the addition of ammonium hydroxide or acetic acid.

Gelatin Solution: 10g/l of best quality gelatin free from aluminum.

A Spekker absorptiometer was used for the data shown in Tables 1 and 2. For convenience in interpreting readings from unknown solutions, calibration curves can be prepared. Spekker conditions were: Filters, H503 + Ilford 605; Lamp, Tungsten; Cell, 2 cm; Water Setting, 1.0. For the calibration data, 1 ml aluminum solution contains 0.01 mg Al (equal to 0.004 per cent on a 0.25 gram sample). In the tables, Drum Difference is the Water Setting (1.0) minus the Drum Reading.

Removes Iron

The mercury cathode separation will remove iron and leave about 5 parts per million in solution. Chenery[1] states that 0 to 10 milligrams of aluminum can be accurately determined in the presence of 200 milligrams of iron, the iron being complexed with thioglycollic acid.

Thioglycollic acid inhibits iron in acid solutions. Thioglycollic acid forms complexes with iron in acid and alkaline solutions. In acid it forms a red color which fades to colorless and in strongly alkaline solution the complex is red. The fixation of iron (ferrous ions after electrolysis) as a colorless complex takes place under the conditions of aluminum-aluminon lake developments, that is, buffering at pH 5.3 and heating for 10 minutes at 100 C.

When gelatin solution was incorporated in the composite solution turbidity sometimes occurred, but when the gelatin was added last no turbidity formed.

As aluminon is not constant in composition, it is necessary to prepare a new set of standards for each bottle opened. The color development was found to be slow at room temperature and it was found that at 100 C the optimum color was obtained in ten minutes, with ten minutes progressive cooling in air and water.

The pH of the solutions at time for color development ranged from 5.25 to 5.4. The average and norm pH was 5.3.

References

1. E. M. Chenery, *Analyst*, vol. 73, 1948, p. 501.
2. J. Carrol, I. Geld, and G. Norwitz, AMERICAN FOUNDRYMAN, vol. 19, no. 6, June 1951, p. 57.
3. J. Carrol, I. Geld, and G. Norwitz, AMERICAN FOUNDRYMAN, vol. 17, no. 4, April 1950, p. 105.
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5. C. H. R. Gentry and L. G. Sherrington, *Analyst*, vol. 71, 1946, p. 432.
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7. G. Evelyn Hutchinson and Anne Wollack, "Biological Accumulators of Aluminium," *Trans. Connecticut Academy of Arts and Sciences*, vol. 35, 1943, p. 80.
8. T. P. Temirenko, *Zavodskaya Lab.*, vol. 13, 1947, p. 621 (*Chemical Abstracts*, vol. 42, 4486-b).

Calendar of Future Meetings and Exhibits

January 1954

22 . . Malleable Founders' Society
Hotel Cleveland, Cleveland. General meeting.

25-28 . . Plant Maintenance & Engineering Show
International Amphitheater, Chicago.

February

1-5 . . American Society for Testing Materials
Hotel Shoreham, Washington, D. C. Committee Week.

11-12 . . Wisconsin Regional Foundry Conference
Schroeder Hotel, Milwaukee.

18-19 . . Southeastern Regional Foundry Conference
Patten Hotel, Chattanooga, Tenn.

March

15-19 . . National Association Corrosion Engineers
Kansas City Municipal Auditorium. 10th Annual Conference.

16-17 . . Steel Founders' Society of America
Edgewater Beach Hotel, Chicago. Annual Meeting.

19-20 . . East Coast Regional Foundry Conference
Philadelphia, Pa.

April

5-7 . . American Institute of Mining & Metallurgical Engineers
Palmer House, Chicago. National Open Hearth Conference.

8-9 . . Malleable Founders' Society
Pittsburgh, Pa. Market Development Conference.

26-30 . . American Society of Tool Engineers' Industrial Exposition
Convention Center, Philadelphia.

May

5-7 . . American Society of Training Directors
Schroeder Hotel, Milwaukee. Annual Conference.

8-14 . . A.F.S. Convention & Exhibit
Public Auditorium, Cleveland.

June

14-15 . . Malleable Founders' Society
Seigniory Club, Quebec, Canada. Annual Meeting.

14-18 . . American Society for Testing Materials
Hotels Sherman and Morrison, Chicago. Annual Meeting.

September

13-25 . . First International Instrument Congress & Exposition
Philadelphia Convention Hall, Philadelphia, Pa.

Fig. 1—Typical unalloyed gray iron with abundance of free ferrite (light areas) and graphite flakes (thick, irregular dark lines). Material is readily machinable. (500x, 4 per cent nital)

Machinability and Microstructure

HANS J. HEINE / *Acting Technical Director, AFS*

H. J. Heine

■ Producers and purchasers of gray iron castings are often puzzled by the machine shop's complaint of machining difficulties which the operator is all too prone to ascribe quite summarily to "hard castings." An unbiased recognition of all factors involved and the realization that any undesirable condition can be quite readily traced, will make possible the elimination of machine down-time, production loss, and excessive tool breakage. This assumes added importance where schedules call for the use of multiple tool set-ups.

The word machinability, though extensively used throughout industry, has defied strict definition since it means different things to different people at different times. To most tool engineers, machinability connotes a combination of factors including: the life of the cutting tool, the surface quality of the finished work, and the power consumed in the operation.

It is established that the machinability of a material as well as its strength and hardness depend on its microstructure (Table 1, from HANDBOOK OF CUPOLA OPERATION, p. 401). These, in the case of cast iron, are predicated not only on chemical analysis and thermal history, but on cooling rate, section thickness, pouring temperature, and other variables.

Significantly, the structural characteristics of a gray iron are not dependent upon any one particular composition, but can be obtained by various analyses. On the other hand, one particular microstructure will give about the same machinability characteristics, regardless of the type of chemical analysis, cooling rate, and other variables which produced it. Extensive studies carried out in recent years have definitely indicated that the microstructure of gray iron is the most useful and accurate indicator of intrinsic machinability characteristics, and the data obtained can be successfully applied to production problems.

Matter of Conviction

It has been hard to convince the machine shop superintendent and even engineers that:

1. The use of Brinell hardness as a guide to expected machinability can lead to completely erroneous conclusions.

2. An iron having 40,000 psi tensile strength and containing alloying additions will not machine just as readily—with the same power requirements, the same evolution of heat, the same distortion of fixtures, the same wear on tools, the same high production rate on the assembly line—as an iron having 20,000 psi tensile strength and containing ferrite and graphite only.

3. Causes for lack of machinability can be found both in the foundry and the machine shop.

A careful analysis of all machining difficulties in-

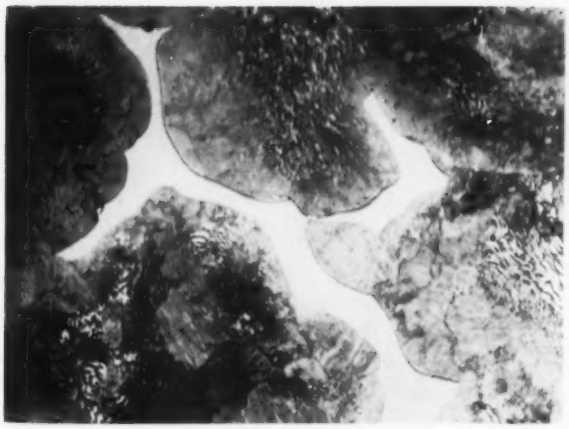


Fig. 2—Free cementite (light area with no graphite flakes nearby) impairs machinability. Balance of microstructure mostly pearlite. (500x, 4 per cent nital)

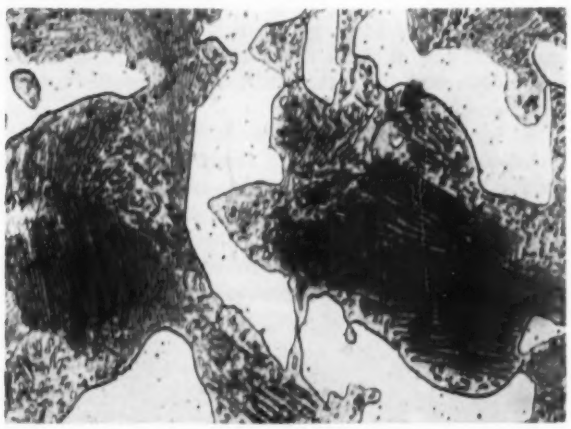


Fig. 3—High proportion cementite (light speckled areas) show this iron difficult to machine. Small gray particles are manganese sulphide. (500x, 4 per cent nital)

vestigated over a number of years at the various plants which the writer's activities covered, have permitted some broad classifications to be set up (Table 2). For proper evaluation, no elaborate instrumentation or research facilities are needed—only very simple tools. Often visual examination and fracturing of the casting as well as observation of machining will suffice.

Important Element

It cannot be overemphasized that tool grinding is one of the most important elements affecting tool life, as variations in surface quality and geometric shape (rake, nose radius, side cutting edge angle, end cutting edge angle, etc.) may produce differences, which in themselves are greater in their ramifications than those of the variable—the gray iron in the machine—being studied. With respect to the cemented carbides being used in tipped tools for turning, it is recognized that wide variations exist in the products of different manufacturers. Major variables encountered are: amount of voids (effect of porosity of commercial compositions on both strength and tool life); uniformity of structure; grain size; and grinding operation for brazed tools.

Acknowledgment of the existence of these variables will preclude indiscriminate substitution of the product of one manufacturer for that of another without careful evaluation of the order of magnitude of the variation in the representative brands of cemented carbides.

While, in the final analysis, every shop will have to work out its own salvation to fit its individual needs, a series of representative photomicrographs which illustrate clearly some of the causes of difficulties encountered can serve as standards for the average shop.

Figure 1 shows the typical microstructure exhibited by an unalloyed gray iron. It has an abundance of free ferrite and graphite. At the same time the amount of pearlite is sufficient to meet tensile strength values

TABLE 1—PROPERTIES OF MICROCONSTITUENTS OF CAST IRON

Micro-constituent	*Physical Condition in Casting*	*Tensile Strength, psi.*	*Elongation, per cent*	*Brinell Hardness*	*General Properties*
Ferrite	Iron containing iron silicide in solid solution	38,000 to 85,000 depending on silicon content	51 to 43	70 to 120	Very soft and ductile. Poor abrasion resistance. Sometimes difficult to machine because chips do not break free of tool. Gives poor machined finish.
Cementite	Compound of iron and carbon	Over 200,000	None	550	Very hard and brittle. Impossible to machine. Actual strength very high, effective strength only about 5000 psi.
Pearlite	Laminated structure of ferrite and cementite	120,000	15 to 20	197 to 225	Good strength and ductility. Machines freely unless very fine. Good abrasion resistance. Machined finish usually good.
Graphite	Carbon in form of flakes	None	None	Very soft	Natural lubricant during machining. Confers low sensitivity to notch effect and high damping capacity on cast iron, but decreases tensile strength.
Steadite	Compound of iron and phosphorus, Fe_3P, dissolved in iron	None	Brittle	400	Hard, friable, and without strength. May cause hard spots which are unmachinable, especially in high phosphorus irons if slowly cooled.
Manganese Sulfide	Compound of manganese and sulphur, MnS	None	None	Soft	An impurity. Has no valuable properties but is not detrimental in cast iron unless present in large amounts.

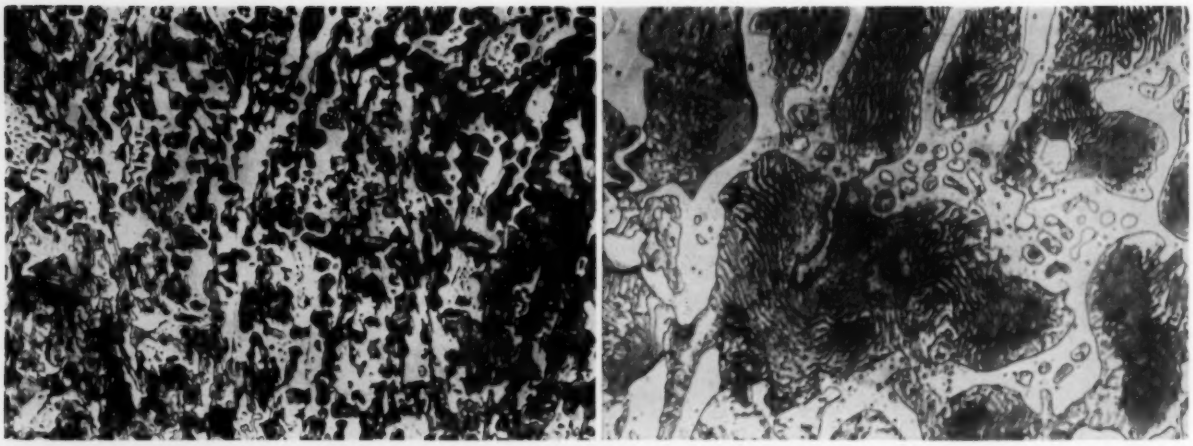


Fig. 4—Iron of normally gray composition severely chilled and extremely difficult to machine. Structure is entirely cementite (light) and pearlite (dark). Magnification, left, 100x; right, 500x. 4 per cent nital.

estimated at between 28,000 to 32,000 psi. The structure is heterogeneous, i.e., well broken up and therefore quite readily machinable. Tool life expectancy should be excellent with this type of material.

Free Carbide in Iron

Figure 2 shows a photomicrograph exhibiting the typical appearance of particles of free carbide in a 3-in. alloy iron casting. It is characterized by the absence of graphite in the vicinity of the carbide and the fully pearlitic microstructure surrounding it. An abundance of free carbides will greatly impair machinability, although an isolated particle, or a group of very small particles even in clusters, will not.

The chemical analysis of this iron indicated that the nickel-chromium ratio was not balanced and that the combined carbon value exceeded the eutectoid. Both these factors unquestionably contributed to the occurrence of free carbides. Composition was: total carbon, 3.39 per cent; graphite, 2.42; combined carbon, 0.97; silicon, 2.42; manganese, 0.48; phosphorus, 0.15; sulphur, 0.12; nickel, 0.29; chromium, 0.40; and molybdenum 0.22.

An iron exhibiting amounts of carbide sufficiently excessive to interfere with ready machinability is shown in Fig. 3. Chemical analysis indicated that combined carbon was far in excess of the eutectoid, readily accounting for the cementite. Chemical analysis was as follows in this unalloyed iron: total carbon, 3.17 per cent; graphite, 1.89; combined carbon, 1.28; silicon, 2.19; manganese, 0.36; phosphorus 0.38; and sulphur, 0.20.

TABLE 2—MAJOR CAUSES FOR MACHINING DIFFICULTIES

- A. Metal
  - 1. Surface
    - a. Hard spots
    - b. Hard scale
    - c. Chilled edges due to core wash
    - d. Sand in surface
  - 2. Cross Section (microstructure)
    - a. Free carbides due to
      - (1) high Cr content
      - (2) unbalanced Ni-Cr ratio
      - (3) low Si in unalloyed iron; high combined carbon content, low carbon equivalent value
    - b. Acicular structure (heat treated)
    - c. Excessive amounts of phosphide-eutectic
- B. Tooling
  - 1. Machines run at higher speeds and feeds than what layout calls for.
  - 2. More tools employed than what layout calls for.
  - 3. Capacity of machines exceeded even with readily machinable iron.
  - 4. Dull or improperly ground tools.
  - 5. Standard speeds and feeds not set for type of gray iron under specification requirements.
- C. Miscellaneous
  - 1. Castings received have excessive stock in the rough.

Chilled Near Core

Figure 4 is indicative of the microstructure of a gray iron which was severely chilled in sections near the cored portion of the casting. This was due to the inadvertent and excessive use of a tellurium core wash. Tellurium is a potent carbide stabilizer. The chemical analysis of the base iron was normal and suitable for the job.

This type of structure will offer severe resistance to machining and cause ready breakdown of tools, as the hardness of the white platelets of iron carbide exceeds 500 Brinell.

The structure in Fig. 5 was found to vary between 250 and 350 Brinell hardness. The casting was virtually unmachinable and had been alloyed by mistake. It contained an excess of 1 per cent manganese, approximately 2½ per cent nickel, more than 0.50 per cent chromium and approximately 20 points of molybdenum. Constituents to be discerned in the structure are massive carbides as well as martensite (acicular particles).

Figure 6 shows a valve body which caused machining difficulties and premature breakdown of cutting tools because of the presence of excessive amounts of phosphide eutectic (steadite). The crescent-shaped particles can be readily distinguished. The chemical analysis of the iron was normal in all respects except for the phosphorous content which was found to amount to an average of 0.40 per cent, but may have

Fig. 5—Alloyed by mistake, this iron is almost unmachinable because of massive carbides (light) and needle-shaped particles of martensite. (500x, 4 per cent nital)

Fig. 6—Crescent-shaped light, speckled areas of phosphorous-rich steadite caused machining difficulties in this iron. (500x, 4 per cent nital)

been considerably higher in certain areas due to segregation.

That Brinell hardness measurements can lead to faulty conclusions regarding machinability characteristics can be readily seen from the following example: Take a matrix with a Brinell hardness of 100, containing 10 per cent of constituents like free cementite with a hardness estimated at 1100 BHN. This would result in an average Brinell hardness of 200, and the material would unquestionably be very difficult to machine due to the presence of free carbides. Another piece of gray iron, which consists entirely of a matrix with a Brinell hardness of 200 would, however, be relatively easy to machine. While the average Brinell hardness of the two materials is exactly the same, machinability characteristics vary fundamentally.

It has been found, when plotting hardness values against machinability rating, that very poor correlation is obtained; numerous data are available to show this.

Close Cooperation Needed

Improvement of machining conditions and machinability requires careful analysis and a thorough understanding of the elements which make up the machining process. In an effort to prevent the shipment of castings which may give rise to difficulties on machining, close cooperation between the foundry and the shop is mandatory. The breaking of representative castings for visual examination at frequent intervals and the recognition that microstructure alone is the most potent indicator of machinability rather than Brinell hardness will go a long way toward the elimination of excessive tool breakage, impaired production schedules, and machine downtime.

While the casting skin, and inclusions and subsurface discontinuities, as well as other extraneous causes can be definitely detrimental to tool life, the distribution, size and type of constituents present will have the most important bearing on how the machine operator classifies the casting.

Thomas Kaveny, Jr., Elected To AFS Board of Directors

Thomas Kaveny, Jr.

THOMAS KAVENY, JR., president, Herman Pneumatic Machine Co., Pittsburgh, Pa., has been elected by the AFS Board of Directors to serve the unexpired term of Victor F. Stine, Pangborn Corp., Hagerstown, Md. Mr. Stine resigned his directorship because of the pressure of business commitments. Mr. Kaveny took office as of December 2, 1953.

Born in Buffalo, N. Y., in 1904, he attended Duquesne and Cornell universities, receiving a B.S. in mechanical engineering from the latter school in 1927. Post-graduate work followed at the University of Pittsburgh and at Carnegie Tech.

During his college work, Mr. Kaveny had worked in the plant of Herman Pneumatic Machine Co. at Zelienople, Pa., where he became a special apprentice on completion of his education.

His entire business career has been with this firm, for which he went to Australia in 1928 and to Europe in 1929 to establish sales and manufacturing agencies. In 1933 he became vice-president. He was made president of the organization in 1945.

Mr. Kaveny has served on various AFS committees and is now on the Convention and Exhibits Policy Committee. He was president of F.EM.A. (1945-46) and is currently a trustee and vice-president of F.E.F. He has performed invaluable service to the foundry industry by serving, during the past decade, on various W.P.B. and N.P.A. boards and agencies in Washington, D.C.

The Engineer in Profile— A Character Analysis

What is an engineer? What are his general characteristics? An industrial psychologist takes a close look at some of his important behavior patterns . . .

J. Elliott Janney

Taken from address entitled "The Uses and Abuses of Discipline" by J. Elliott Janney, Rohrer, Hibler & Replogle, Cleveland, presented at the 1953 annual meeting of the Foundry Educational Foundation.

1. Engineers are mentally alert. They may or may not be wise, but one can be almost certain that the stupid students have long since been weeded out. This means to the practical foundryman that he has a fast learner on his hands when he employs the engineer.

Not long ago I talked with a young foundry engineer who wanted to quit before his first year was up. His employer was green at handling engineers and had made the mistake of setting up a course of sprouts which was below the intellectual level of the youngster.

2. Engineers are more likely to be number-minded than word-minded. Most of them are likely to think and talk in terms of figures, blueprints, formulas, and ratios.

They have little difficulty in communicating with each other and/or other technical men. However, the frequent lack of skill in the use of words and the use of figures of speech makes it difficult for many engineers to present reports and carry on differences of opinion with other kinds of people without frustration.

This difficulty is further illustrated by the observation that some of the most frustrated people in the world are the English teachers in engineering schools. The same problem comes up in several companies where it has been found necessary to look for the very unusual or exceptional engineer who is both word-minded and number-minded and attach him as a staff man to general management so as to maintain high level liaison between the engineers and others in the organization.

To put it in another way, the engineering discipline results in a man's being able to use one symbol where other men would use a whole paragraph, such as the integration symbol in calculus. To the people of other disciplines, the ordinary conversation of the engineer at times listens almost like the quarterback giving signals on the gridiron.

3. Engineers are usually highly adept in perceiving spatial relations. Even in carrying on the most ordinary conversation, the typical engineer frequently and automatically reaches for a piece of paper and a pencil and begins to sketch out his ideas in visual form.

It is a conservative estimate that the graduates of any first-class engineering school which requires descriptive geometry for graduation will be in the highest ten per cent of the general population in the ability to perceive and handle special relations such as diagrams, charts, graphs, blueprints, and the like.

Employers just beginning to hire engineers for the first time can save themselves countless headaches and many dollars by calling on the engineer for the use of flow charts, diagramatic layouts, architectural projections, and the like in the planning phases of new programs. It is much easier and cheaper to rub out a tracing on a drawing in the planning stage than to tear down a wall after the building is modified.

4. Engineers are usually meticulous. This applies especially to those engineers whose training was highly concentrated in mathematics and the physical sciences. They are sometimes even accused of wasting valuable time by picking the fly specks out of the pepper.

Those engineers whose training has not been primarily mathematics and science may or may not be as conscientious as those whose training has been along these lines. For instance, in industrial engineering it is much more difficult to determine whether one is right or wrong than it is in mechanical engineering. Consequently, the industrial engineers need not be held to the rigorous standard of perfection of the mechanical engineers.

The issue of meticulous precision as an aspect of mental discipline is of significance whenever the technology of an industry changes so as to require rigorous and complex standard of quality control. Tight controls go hand in hand with the increasing demand for more engineering talent in the industry.

5. Engineers are more likely to be method-centered than problem-centered in their thinking. Here we are describing a trend to which there are many obvious exceptions. By and large, however, the university student who is a seeker after truth for its own sake is likely to register in the pure sciences. On the other hand, the youngster who is interested in practical usage is more likely to register in engineering.

However, there is an increasing overlap between science and engineering as more engineers go on for the doctorate and more scientists begin to smell the commercial possibilities of their discoveries.

For the time being, the practical foundryman probably will continue to look almost exclusively to the engineering schools for his technical men. However, as electronic controls and shell molding continue to develop, the foundryman of the future may well find himself employing an increasing number of physicists, chemists, and mathematicians.

As to another practical outcome, one may note that the Society for the Advancement for Management has an unusually large number of engineers in its membership. It is men whose training has been in "know-how" who are the most interested in developing the "how-to" of modern management.

6. Engineers are usually much better at handling tangibles than intangibles. Consider the plant operation which is well engineered from a mechanical standpoint. Also, the processes are ingeniously engineered from the control standpoint. The standards and rates have been precisely and equitably set from the efficiency standpoint. Yet, the plant efficiency may be far below 100 per cent because the intangibles of employee thinking have not been properly discounted. The failure to properly assess and correct for the intangibles in the human equation results in some fellows dogging the job on advice they get from the washroom lawyers.

7. Engineers are more likely to be logical and analytical than persuasive and intuitive. As one of them said to me, "Since I quit doing the engineering myself and got into general management, I have just found out that facts are so unimportant." He went on to explain that he was just beginning to find the critical importance of feelings, attitudes, prejudices, and biases. As an engineer, he could calculate within certain limits the stresses and strains in metals, but now in general management he could only guess at the stresses and strains between people and in people. Yet it is handling the human strain and stress that a large part of general management is all about anyway.

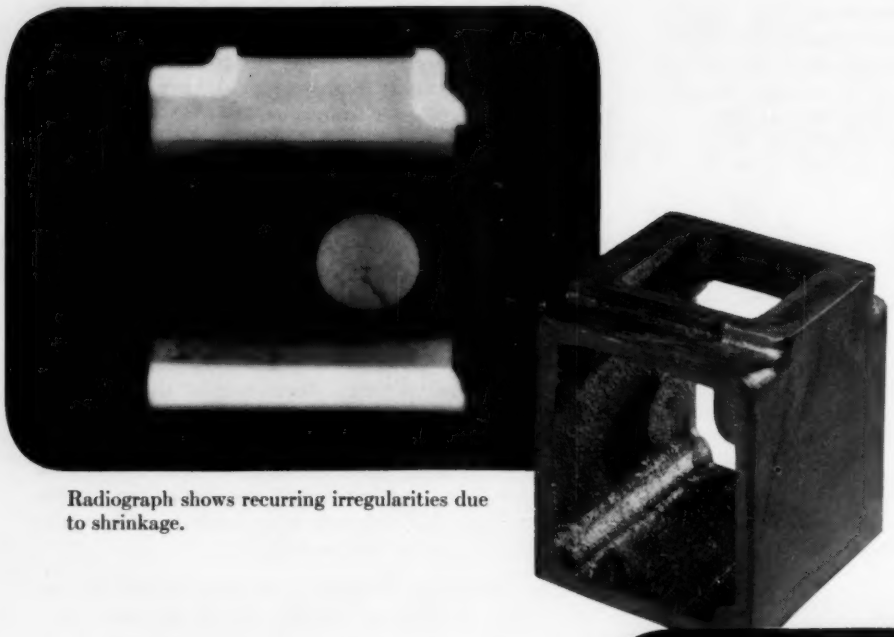
Also, the new technical discoveries of the engineers are most likely to be the result of rigorous and penetrating analysis. More and more of our technical advances are coming from the teamwork of many analysts, and fewer and fewer new discoveries are coming from the old-style inventor who made his discoveries by sudden flashes of inspiration.

Our technology is becoming so intricate and so complex that it is doubtful whether we will see many more Ketterings, Edisons, Steinmetzes, Westinghouse, or Eli Whitneys.

Foundry management needs to adjust itself to the prospect of a multiple operation in research and development. This means that the smaller organizations will need to farm out many or even most of their technical problems to professional research organizations rather than developing their own research programs.

8. Engineers are more likely to veer toward the introvertive end of the human spectrum than toward the extrovertive end. This means that the typical engineer is quite likely to be highly skillful in the preventive maintenance aspects of keeping an operation under way. His planning and scheduling will show a very high order of anticipating and offsetting future difficulties. However, at the same time it also means that when the roof falls in, it is only the exceptional engineer who is able to improvise on the spot and to take the leadership of other men for corrective action. This also means that the practical foundryman who is expecting to recruit his future management from the young engineers hired today will need to give special attention to being certain that he is getting not only a man who has the mental discipline of the engineer but also the ascendant personality qualities required for effective management.

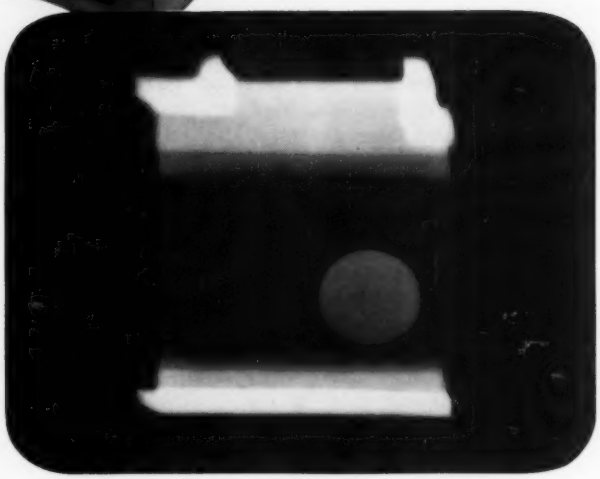
9. Engineers are usually masculine in temperament. The old song about the hairy engineers with dirt behind their ears certainly overstated the case about the dirt, but not about the hair. Seldom, if ever, does one in our professional practice find an effeminate engineer. It has been observed that of men in all occupations, engineers probably do the least gossiping of any.



Radiograph shows recurring irregularities due to shrinkage.

RADIOGRAPHY

puts the finger on a profit thief



A change in gating produced sound castings.

Shrink was a problem in casting this instrument housing of 355 aluminum. It looked like the yield would run low.

But radiographs of pilot runs put the finger on the cause—revealed a pattern of recurring irregularities. This suggested a change in gating which, when adopted, quickly corrected the difficulty.

Cases like this show why more and more foundries make radiography a routine practice. It proves their work sound—helps build a reputation for consistently good castings.

Wouldn't you like to know how Radiography can work for you? Get in touch with your x-ray dealer. Or, write us for a free copy of "Radiography as a Foundry Tool."

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Chill Testing of Cast Iron

(Tentative method accepted at the annual meeting of the American Society for Testing Materials, June 1953 A.S.T.M. Designation A367-53T)

Scope

1. These methods of chill testing apply to gray irons which are to be free of chill in the casting and to chilled irons which are to have a specified depth of chill in the casting. Two methods of determining the chilling tendencies of cast iron are covered as follows. For many applications either method will be satisfactory if test pieces of the proper dimensions are selected.

Method A. Wedge Test.—This test is generally better adapted to the higher strength gray irons. The accelerated cooling rate to induce the formation of a chill is brought about through the design of the test specimen. This method is simpler than Method B since maintenance of chill blocks or plates is not necessary.

Method B. Chill Test.—This test is better adapted to the softer grades of gray iron and should be used if the casting is to have a specified depth of chill. The chill in this type of test is induced by casting one edge of the test specimen against a metal or graphite chilled plate or block.

METHOD A. WEDGE TEST

Application

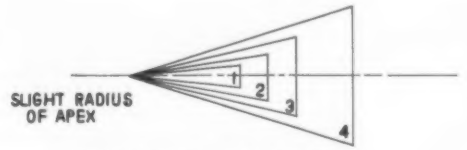
2. Selection of a test specimen of appropriate dimension will allow measurement of chilling tendencies of all gray iron composition, with the exception of those having silicon contents much over 2.50 per cent together with carbon contents over 3.50 per cent.

Test Specimens

3. The patterns for the test specimens shall be made of metal to the dimensions shown in Fig. 1. With the exception of the length of the test specimen, dimensions shall not vary more than plus or minus $\frac{1}{32}$-in. The tolerance on the length of the specimen shall be plus or minus $\frac{1}{8}$ in. The radius on the apex of the wedge should be formed by filing a $\frac{1}{32}$-in. flat on the sharp edge of the metal pattern and then carefully rounding the edges formed by the $\frac{1}{32}$-in. flat and the sides of the wedge. If draft on the pattern is desired, it may be obtained by varying dimension *H* (Fig. 1) from one end of the specimen to the other. The pattern should be mounted in a core box so that the final core can be poured with the wedge in such a position that its length is vertical. There shall be 1 in. minimum sand at the bottom of the core.

Test Procedure

4. (a) *Cores.*—The test shall be made in a core. The cores may be either single cores or gang cores. If a gang core is used, the minimum amount of sand between adjacent test specimens shall be not less than $2\frac{1}{2} \times B$ (Fig. 1). The sand cores shall be well baked and may be either resin or oil bonded. The base sand shall be of such fineness that a smooth casting will be obtained. A sand with an AFS fineness of about 70 will be found satisfactory, although a sand with a fineness of 100 or finer may be used for the smaller test specimens.



CROSS SECTION OF 4 WEDGES

WEDGE DIMENSIONS

WEDGE No.	B, in.	H, in.	A, deg.	Length in.
W1	0.20	1.00	11.5	4
W2	0.40	1.25	18	4
W3	0.75	1.50	28	4
W4	1.25	2.00	34.5	6

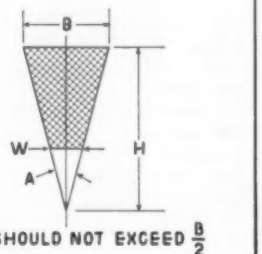


Fig. 1—Dimensions for Test Wedges

(b) *Pouring Practice.*—The test specimens should be poured at a fairly uniform temperature. Precautions should be taken to obtain a representative sample of iron for the test specimen. Best results are obtained with a sample ladle lined with a refractory mixture which is free of graphite and chilled iron. The ladle should hold at least 5 lb of iron in order to avoid excessive chilling of the iron before the test specimen can be poured. Filling the ladle once with iron just prior to obtaining the sample for test is recommended.

(c) *Cooling of Test Specimen.*—If time is an important factor in control applications, the test specimen may be quenched in water as soon as it is completely solid. The quenching must be done carefully to avoid cracking of the chilled apex of the wedge. This may be accomplished by grasping the wedge with tongs at the apex of the wedge and immersing about ¼ to ½ in. of the base of the wedge in water. The wedge may then be gradually quenched but should be removed while there is still a sufficient heat in the wedge to dry off the water. If speed of testing is not important, the test specimen may be either cooled in the core or in the air. If cooled to a very dull red before quenching in water, the demarcation between the chilled iron and the gray iron is somewhat clearer than if the test specimen is quenched as soon as it is solid.

Measurement of Chill

5. The test specimen shall be broken by striking with a hammer in such a manner that the fracture is straight and midway of its length. The chill shall be expressed in terms of $\frac{1}{32}$ in. as measured across the wedge at the junction of the white iron and the gray iron. The location of the measurement is illustrated in Fig. 1. In reporting the chill measurement, the size of test specimen shall be designated. A chill reported as W3-12 would indicate that wedge W3 was used and the width at the junction of the chilled and gray portions of the fracture was $\frac{12}{32}$ in.

METHOD B. CHILL TEST

Application

6. This method is better adapted than Method A to irons having silicon contents of 2.50 per cent and over and carbon contents of 3.50 per cent and over. It is also useful for control purposes in high production foundries making irons somewhat lower in carbon and silicon than indicated above. This method is also preferable for applications in which the casting is to have a specified depth of chill.

Test Specimens

7. The patterns shall be made of metal and conform to the dimensions shown in Fig. 2. All dimensions shall be within plus or minus 1/32 in. of those shown, with the exception of the length which may vary plus or minus 1/8 in. The test specimens shown are designated to be cast in the position shown. This design is the preferred one although for high production work a gang core box and pattern may be used. In this case a test specimen with the chilled face in a vertical position may be found more convenient although it is not considered as satisfactory as the horizontally cast test specimen.

Test Procedure

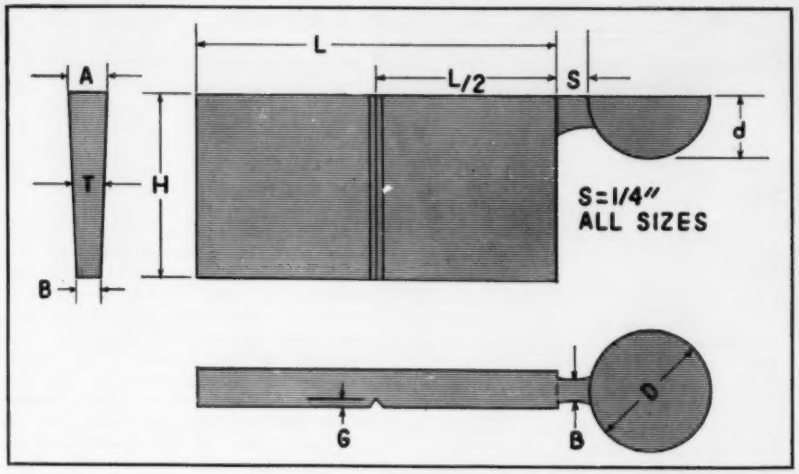
8. (a) *Cores.*—The test shall be made in a core. For general applications, a single core is considered more satisfactory than a gang core. If a gang core is used, the amount of sand between test specimens shall be 1-in. minimum or 2½ x *A* (Fig. 2), whichever is greater. The remarks concerning cores in Section 4(a) apply here also.

(b) *Chill Plates.*—Chill plates may be cast iron, steel, copper, or graphite. The surface of the chill plate shall be machined. When single test specimens are cast, the chill plate shall extend at least 1 in. beyond the test specimens in all directions and shall be at least 1 in. thick. For high production work, a sufficient number of chill plates must be available to keep the temperature of the plate below 500 F.

A water-cooled steel plate will be found more satisfactory for high production work. A water-cooled plate having a reservoir is preferable to one having circulating water. In the latter case the plate may become too cold, resulting in condensation of moisture on the plate. The chill plate must be kept free of fire cracks and all foreign matter as the depth of chill is markedly affected by the presence of films of burned oil or other accumulations. The best practice is to clean off the plate with a wire brush as soon as the core and test specimen is removed.

(c) *Pouring Practice.*—Remarks on pouring practice in Section 4(b) apply here. In addition, iron shall not be poured directly on the chill plate as the depth of chill may be affected or the test specimen may burn on the chill plate. It may be desirable to place a weight on the core when pouring it as there may be a tendency for the core to lift as it is being poured. The opening in the core shall be free of sand fins and shall set flat on the chill plate. In the event the core does not fit the chill plate, it shall be rubbed until it does.

(d) *Cooling of Test Piece.*—The remarks in Section 4(e) apply here. If rapid testing is desired, the chill test specimen may be quenched in water, starting with the edge farthest from the chilled edge.



Recommended Chill Depth Range

RECOMMENDED DIMENSIONS, in.

CHILL TEST No.	T	A	B	H	L	D	d	G	1/32 in.*
1C	3/16	1/4	1/8	1 1/4	2 1/2	3/4	1/2	1/32	3 to 12
2C	1/4	5/16	3/16	1 1/2	3	7/8	1/2	1/32	4 to 16
3C	3/8	7/16	5/16	1 3/4	3 1/2	7/8	1/2	1/16	6 to 24
4C	1/2	9/16	7/16	2	4	1	5/8	1/16	8 to 32
5C	3/4	13/16	11/16	2 1/2	5	1	5/8	3/32	12 to 48

*T/2 to 2T

Note 1. Casting to be made in a dry sand core. Note 2. Allow 3/4 in. of sand on all sides.

Fig. 2—Recommended Dimensions for Method B Chill Test Specimen.

Measurement of Chill

9. The test specimen shall be broken in such a manner that the fracture is straight and follows the notch in the test specimen. The chill shall be measured from the chilled face to the junction of the white iron and gray iron portions of the fracture. In the case of a broad mottled zone, it may be necessary to indicate whether the measurement is "clear chill" or includes part of the mottled zone. The depth of chill shall be expressed in terms of 1/32 in. and the size of test specimen used shall be designated. For example, a measurement recorded as 4C-12 indicates that test specimen design 4C was used and the depth of chill was 12/32 in.

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Among good foundrymen, you'll find many an experienced man who prefers National Bentonite for bonding because he knows he can depend on the many properties it offers to provide a superior bond . . . which means, in terms of better production, better castings which require less time in the cleaning room.

Proper moisture control being one of the most important factors in good mold characteristics, it's always best to use a bonding material that requires the least amount of water to temper correctly. Foundrymen have found that they can control their moisture content correctly with proper proportions of National Bentonite in their molding sand. That's why so many good foundrymen say, "I can rely on National Bentonite."

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Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

Shop talk

Practical Questions and Answers

Polyelectrolyte

What is a polyelectrolyte that some foundrymen are reported to be adding to their sand? What is it supposed to do?

Polyelectrolyte is a generic term for complex organic chemical compounds that behave both as polymers and as electrolytes. They are popularly called "soil conditioners" and are sold to gardeners who want to loosen up high-clay soils by chemical means. Some foundrymen have adopted the idea, with varying success, to break down clay balls and improve clay distribution during mixing.

Gray Iron Furnaces

We are considering building a cupola for gray iron and would appreciate information on its construction. Capacity should be about four tons. We would also appreciate information on any other type of furnace that can be used for gray iron.

The cupola has proven to be the most satisfactory and economical means of melting cast iron, except under special circumstances. A substantial fund of information on all details of cupola construction and operation is contained in the AFS publication HANDBOOK OF CUPOLA OPERATION. Assuming that you want four tons per hour and not just a total of four tons of metal per heat, we quote the following figures from the HANDBOOK: Melting Rate, 4 tons per hr; Shell Diameter, 41 in.; Diameter Inside Lining, 32 in.; Bed Height above Tuyeres, 40-46 in.; Coke Charge, 65 lb; Metal (10:1 ratio), 650 lb; Flux, 13 lb; Air through Tuyeres, 1810 cfm; Windbox Pressure, 14 oz; Total Tuyere Area, 121 sq in.; Blower, 2000 cfm with 16 oz discharge pressure.

These figures are not absolute and many operators will deviate from them. However, they provide an excellent starting point. If lower metal to coke ratios must be used, for instance, it is desirable to go to a larger shell and a larger diameter inside the lining. If heats approach eight hours, a thicker lining is desirable and a larger shell should be used.

Before proceeding with the design and construction of a cupola in your own shop, we would strongly recommend that you contact various manufacturers of melting equipment, advising them of the size and type of installation you would like. We are confident that they will give you detailed information, and that you may find it more economical to purchase a cupola already built and of standard design.

Some foundries are making excellent use of direct-arc electrical furnaces, indirect-arc rocking furnaces, and stack-charge reverberatory furnaces. In these cases one or more of the following conditions prevails; favorable fuel cost; desire for batch rather than continuous supply of metal; need for unusually high temperatures; production of high-alloys irons; production of a variety of compositions in small amounts.

Plastic-Coated Crucibles?

What can you tell us about an indefinite report that a foundry is melting magnesium in PLASTIC-COATED clay-graphite crucibles?

We have no information on this improbable combination of materials. Perhaps one of AMERICAN FOUNDRYMAN's many readers can provide information.

Permanent Molds

What should be the approximate analysis of cast iron for permanent molds? What is the best coating to put on permanent molds to keep the metal from burning on, especially in the pouring head and neck?

Permanent molds should be made of gray iron that is high in total carbon content—3.70 to 3.80 per cent carbon, with manganese not over 0.50 to 0.60 per cent, silicon high enough to insure that the casting will be completely gray (usually from 1.50 to 1.75 per cent or higher, depending on the section thicknesses involved), sulphur less than 0.10 per cent, and phosphorus as low as possible, at the most 0.20 per cent.

The primary requisite for a permanent mold is a low modulus of elasticity, and this is accomplished by having high total carbon content. The actual modulus should be on the order of 10 to 11 million psi.

Numerous coating materials are used with permanent molds. Some available on the market are used as purchased, some are propriety mixtures modified for special local conditions, and others are prepared entirely in the foundry. One shop breaks in its mold with a suspension of English pipe clay sprayed onto the heated mold.

Some shops used a coating of very fine silica flour suspended in water to which has been added 2 to 3 per cent of sodium silicate (water glass) and 3 to 4 per cent of western bentonite. These materials will assist in keeping the silica flour in suspension and will also act as an adhesive for the silica.

This preparation must be agitated in order to keep the silica flour in suspension, and is sprayed on the mold while the mold is sufficiently hot to evaporate the water. Only a thin coating should be applied, since heavy coatings tend to spall off and cause a beaded surface on the casting. Just before pouring, the mold face is covered with soot by applying a smoky acetylene flame.

Gray Iron Machinability

I am interested in machining of gray iron castings. Which alloy is best for machining and what tests can be made to prove that a casting will machine properly?

The term *gray iron* covers such a large family of alloys, whose properties vary with cooling rate as well as composition, that it is difficult to state that any given composition is best for machining. Type of machined finish desired and type of machining operation also enters into the picture.

Machinability is dependent upon the mechanical properties of the iron and it should therefore be settled first just what specifications you have to meet. In general, machinability is inversely proportional to tensile strength and a lower strength iron will be much more readily machined than a higher strength iron. Use of inoculatns will enhance machinability of certain al-

loys that would otherwise be more difficult to machine.

Basically, microstructural characteristics are the most important criteria of machinability since microstructure represents the combined results of composition, cooling rate, and heat treatment, if any. Graphite, which gives gray iron its characteristic fracture, is extremely low in strength and is not only readily machinable but acts as a lubricant. Ferrite, which is predominantly iron, is a comparatively low strength material and machines readily though it is somewhat tough and quite ductile as compared to the friable graphite.

Gray iron also contains a hard, difficult-to-machine component known as cementite, a compound of iron and carbon. By itself, cementite renders iron unmachinable in terms of common machine shop practice. In combination with ferrite, cementite forms a third microconstituent known as pearlite. Pearlite is much closer to ferrite than cementite in machinability and in addition does not tear as ferrite does. Pearlite frees itself from the tool more cleanly and readily.

A gray iron consisting essentially of a pearlite matrix with graphite flakes will have good tensile strength and hardness but will be readily machinable. A true gray iron should not have cementite as such, but when this component is present it will influence machinability in proportion to the size and distribution of the particles present. The same is true of ferrite which is a normal constitutent of gray iron.

Hard Spot Can Cause Damage

A hard spot or cementite in an otherwise machinable iron can quickly dull or damage a tool unless the spot is small and the iron is ferritic, hence soft, so that the hard spot can be shoved aside with little tool damage. Another hard-to-machine constituent of gray iron is steadite, a phosphorus-rich component, because it is the lowest-melting portion of gray iron, is invariably found at grain boundaries. Good engineering irons are not likely to be unmachinable because of excessive amounts of steadite. However, some instances have been noted where an otherwise machinable iron was difficult to hand scrape due to steadite.

If mechanical properties are not important, try using a "soft" iron, high in ferrite. This will be achieved generally by using higher carbon and silicon than you are now used to. Because of the influence of small amounts of cementite and steadite, as indicated above, do not be misled into believing that hardness in itself indicates machinability.

Production Details

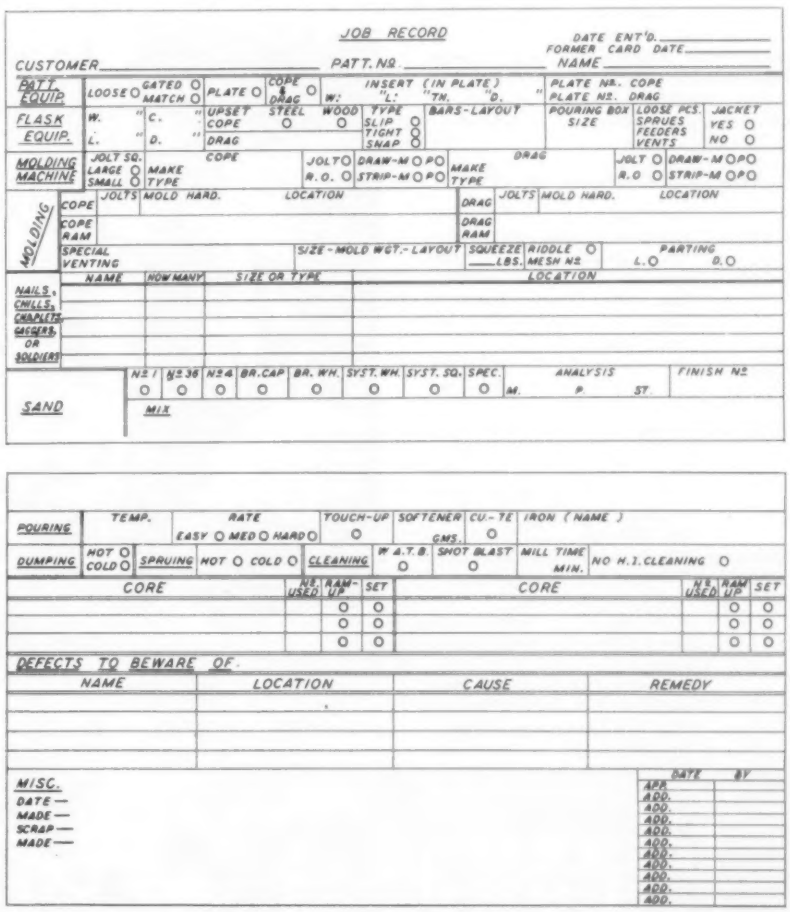
We're having trouble tying casting defects in with casting changes made to eliminate defects. What methods are currently being used to quickly tie defects down so attempts to make future castings will be more successful?

Close liaison among Inspection, Engineering, and Production is essential. So is a detailed record of significant production information on each casting. More and more foundries are setting up card files, a card for each pattern, so that production procedures are not a matter of memory. In addition to production details and a scrap record, the cards often include sketches or photographs of castings with gates and risers attached or with indications as to size and location of gates, risers, chaplets, and chills.

Latest AMERICAN FOUNDRYMAN articles illustrating record cards of this type appeared in September 1953, pp. 48-52, and September 1952, pp. 34-36. Extent to which some foundries go in keeping track of easily-forgotten production information is shown by the illustrations of cards used by Erie Malleable Iron Co., taken from the 1952 article.

Many companies hold daily scrap meetings at which the causes of defects are established and immediate steps decided on for avoiding a recurrence. Some shops hold periodic, often weekly, meetings of representatives of Inspection, Production, and Engineering to develop best possible ways for designing and redesigning parts so they can be most economically produced.

Ultimate in liaison for the purpose of producing higher quality castings seems to have been reached by the foundry which uses an "excess scrap" procedure. An order is not permitted to go into the shop if records of the type mentioned above show that the last run on the pattern resulted in over 3 per cent scrap *until representatives of Production, Quality Control, Inspection, Engineering, and Metallurgy have met and decided on some improved production procedure.*



Job Record Card used by Erie Malleable Iron Co., front view above, back below. Under Molding Machine, M means manual, P means power; under Parting, L means liquid and D means dry. On back of card under Cleaning, W.A.T.B. refers to use of a centrifugal blast cleaning machine.

Release Program For Southeastern Regional

SPONSORED by three AFS chapters—Tennessee, Birmingham District, and University of Alabama Student — the twenty-second annual Southeastern Regional Foundry Conference is scheduled for the Patten Hotel, Chattanooga, Tenn., February 18 and 19, 1954.

Chairmen for the various committees and activities concomitant with the conference have been announced: *General Chairman,* P. L. Arnold, U. S. Pipe & Foundry Co., Chattanooga; *Finance,* W. M. Hamilton, Crane Co., Chattanooga Division; *Program,* C. S. Chisolm, Wheland Co., Chattanooga; *Printing,* C. A. Fischer, Jr., Fischer Supply Co., Chattanooga; *Registration and Arrangements,* H. F. Bohr, Jr., Robbins & Bohr, Chattanooga; *Publicity,* F. M. Robbins, Jr., Robbins & Bohr, Chattanooga; *Plant Visitation,* K. L. Landgrebe, Wheland Co., Chattanooga; *Greeters and Entertainment,* Porter Warner, Jr., Porter Warner Industries, Inc., Chattanooga.

The tentative program, subject to some revision, is reported as follows:

Thursday, February 18, 1954

9:00 am: Registration

10:00 am: **Technical session,** Red Room "New Trends in Cupola Operation," Gosta Vennerholm, Asst. Mgr., Mfg. Research Dept., Ford Motor Co., Dearborn, Mich.
Chairman: J. E. Reynolds, U.S. Pipe & Foundry Co., Bessemer, Ala.

11:00 am: **Technical session,** Red Room "Current Trend in Molding Sand Mixtures for Foundry Use," C. A. Sanders, vice-president, American Colloid Co., Chicago.
Chairman: T. C. Alford, The Wheland Co., Chattanooga.

12:30 pm: Luncheon, Ballroom
Presiding: P. L. Arnold, U.S. Pipe & Foundry Co., Chattanooga.
Welcoming address: The Honorable P. R. Olgiati, Mayor, City of Chattanooga, Tenn.
Invocation: Dr. J. L. Fowle, First Presbyterian Church, Chattanooga.
"Your AFS and Its Progress," F. J. Dost, Vice-President, AFS; and W. W. Maloney, Secretary-Treasurer, AFS.

2:15 pm: **Technical session,** Red Room "Supervisory Incentives, a Tool for Cost Control," C. J. Pruet, Chief Industrial Engineer, McWane Cast Iron Pipe Co., Birmingham, Ala.
Chairman: N. D. Neptune, National Cast Iron Pipe Div., James B. Clow & Sons, Tarrant City, Ala.

3:15 pm: **Technical session,** Red Room "Shell Molding and Methods Engineering," J. H. Smith, General Manager, Central Foundry Div., Gen. Motors Corp., Saginaw, Mich.
Chairman: W. W. Coleman, Coleman Engineering Company, Chattanooga.

4:15 pm: **Technical session,** Red Room "Developments in Foundry Sand Reclamation," C. E. Wenninger, development engineer, National Engineering Co., Chicago.
Chairman: H. M. Barker, U.S. Pipe & Foundry Co., Chattanooga.

5:15 pm: **Technical session,** Red Room "Safety and Hygiene," W. N. Davis, Director of Safety, AFS, Chicago.
Chairman: W. M. Hamilton, Crane Co., Chattanooga Division.

Friday, February 19, 1954

9:00 am: **Plant visitations** (all in Chattanooga area): Eureka Foundry Co.; Harriman Mfg. Co., Inc.; Mueller Co.; Ross-Meehan Foundries; Somerville Iron Works; Southern Shell

continued on page 77

CASTING through the Ages
IN THE 1760's, ITINERANT COLONIAL MOLDERS, CARRYING STOCKS OF HAND CARVED PATTERNS ON THEIR BACKS, TRUDGED FROM IRON PLANTATION TO IRON PLANTATION WHERE THEY FASHIONED ELABORATE FIRE BACKS AND STOVE PLATES BY POURING MOLTEN METAL DIRECTLY FROM THE FURNACES INTO THEIR ARTISTIC MOLDS.
AN ANCIENT STONE MOLD DUG UP IN THE ISLE OF ANGLESEA CARRIED ON EACH OF ITS FOUR SIDES INDENTATIONS FOR CASTING VARIOUS WEAPONS. THIS MOLD WAS FASHIONED TO PRODUCE TWO SPEARS, A LANCE OR ARROW AND A CELT WITH THREE LOOPS ..
EARLY IN THE 1700's, NEWCOMEN, WATT'S PREDECESSOR, MADE THE CYLINDERS OF HIS PIONEER STEAM ENGINES OF CAST IRON ...
Odd Bits
30,000 feet of bell
AND SPIGOT TYPE IRON PIPES, CAST ON THE SIDE WITH GREEN MOLDS AND DRY SAND CORES, WERE INSTALLED IN PHILADELPHIA IN 1822.

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- *No Weighing*—Each bag (25 lb. of contained vanadium) can be added without weighing.
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- *High-Quality Material for Every Need*—ELECTROMET ferrovanadium is uniform in analysis, closely graded, correctly sized, and physically clean. It is furnished in four grades:

	Vanadium	Silicon max.	Carbon max.
High-Speed Grade	50 to 55%	1.50%	0.20%
Special Grade	50 to 55%	2%	0.50%
Open-Hearth Grade	50 to 55%	8%	3%
Foundry Grade	50 to 55%	approx. 10%	3%

* **Immediate Delivery**—Vanadium is readily available and can frequently be used in engineering steels to replace part, if not all, of certain scarcer alloys.

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Wisconsin Program Listed

TENTATIVE program for the Wisconsin Regional Foundry Conference has been released by R. V. Osborne, Lakeside Malleable Castings Co., Racine, Wis., who is chairman of the two-day meeting.

This seventeenth annual conference sponsored by the Wisconsin Chapter of AFS will be held at Milwaukee's Hotel Schroeder on February 12-13, 1954. Co-chairman will be P. C. Fuerst, Falk Corp., Milwaukee.

Advance registration can be made through Leonard Gratz, G. & O. Pattern Works, 1630 Pierce St., Milwaukee 4, Wis. Price of full Conference tickets is $12 each.

The program, which is still subject to minor changes, is announced as follows:

Thursday, Feb. 11, 1954

9:00 am: Registration

10:00 am: Welcoming addresses: Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., and National President, American Foundrymen's Society; and Dean Kurt F. Wendt, University of Wisconsin, Madison.

10:40 am: General meeting
(To be announced)

Noon: Luncheon
Speaker: H. J. Heine, Acting Technical Director, AFS, Chicago.

2:15 pm: Sectional meetings
Malleable—"Work Simplification," J. H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich.
Non-ferrous—"Light Alloy Foundry Practice," Hiram Brown, Solar Aircraft Co., Des Moines, Iowa.
Gray Iron—"Up-to-the-Minute Coverage of Synthetic Resins in the Foundry," W. A. Sokolosky, Monsanto Chemical Co., St. Louis.
Steel—"Practical Applications of Recent Information to the Feeding of Steel Castings," B. C. Yearley, National Malleable & Steel Castings Co., Cleveland.
Pattern—"Casting and Related Pattern Design," W. P. Bender, General Electric Corp., Erie, Pa.

4:00 pm: Sectional meetings
Malleable—"Mechanization of Core Making," (film), presented by D. M. Gerlinger and Adam Kaska, Walter Gerlinger, Inc., Milwaukee. "Malleable Melting Practice," W. D. McMillan, McCormick Works, International Harvester Co., Chicago.
Non-ferrous—(To be announced)
Gray Iron—"Cupola Practice," S. F. Carter, Jr., American Cast Iron Pipe Co., Birmingham, Ala.
Steel—"Modernization of the Foundry," G. W. Merrefield, Giffels & Vallet, Inc., Detroit.
Pattern—"Where Now?" G. K. Dreher, Waukesha Foundry Co., Waukesha, Wis.

6:30 pm: Conference banquet
Speaker: David P. Livingston, Washington, Iowa; "Bread, Butter and Baloney."

Friday, Feb. 12, 1954

10:00 am: Sectional Meetings
Malleable—"Effect of Melting Furnace Atmospheres on Mechanical Properties of Malleable Iron," Prof. R. W. Heine, University of Wisconsin, Madison.
Non-ferrous—"Brass Foundry Practice," H. M. St. John, Crane Co., Chicago.
Gray Iron—"Core Blowing Practice," (Speaker to be announced).
Steel—"Housekeeping in the Foundry," C. G. Lauckner, General Electric Co., Schenectady, N. Y.
Pattern—"Practical Construction of Wood Patterns," W. H. Siebert, Cleveland Standard Pattern Works, Cleveland.

Noon: Luncheon
Speaker: W. F. Scholtz, Allis-Chalmers Mfg. Co., Milwaukee; "Combating the Effects of Noise."

2:30 pm: Sectional meetings
Malleable—"Foundry Refractories," R. A. Witschey, A. P. Green Fire Brick Co., Chicago.
Non-ferrous—"Information Forum."
Gray Iron—"Gating and Risering," T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va.
Steel—"Casting Quality As Related to pH Values of Sand," G. J. Grott, Unitcast Corp., Toledo, Ohio.
Pattern—"Patterns for Shell Molding," Ray Olson, Shell Process, Inc., Chicopee, Mass.

La Porte (Ind.) Foundry Co. joined in the observance of American Education week on November 10 by presenting an 8-hour program for teachers from the city schools. Demonstrating for the teachers are A. J. Rumley, Jr. (left), La Porte Foundry; and E. E. Woodliff, Foundry Sand Service & Engineering Co., Detroit, who aided the staff in developing the educational program

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Abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the complete articles briefed below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage. Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

■ **A335 . . "Make the Foreman Part of Your Incentive System," John Taylor, *American Foundryman*, vol. 24, no. 4, October 1953, pp. 50-51.**

Management benefits from having supervisors trained in uses of incentive systems, time study, and motion analysis. A program for training supervisors in a series of seven one-hour meetings is given.

■ **A336 . . "Large Casting Poured in West," *American Foundryman*, vol. 24, no. 4, October 1953, pp. 47-48.**

Picture story shows how mold for largest single-piece pump castings ever produced on west coast was assembled from 89 cores. Castings weighed 38,000 lb.

■ **A337 . . "A Basic Foundry Cost System," Earl Paltenghi, *American Foundryman*, vol. 24, no. 4, October 1953, pp. 62-66.**

It is not necessary for a foundry to have an elaborate cost system, but the more refinements that can be made to a simplified system the more accurate the cost determination will be. A simple cost system is outlined and its use is illustrated by carrying through sample calculations. A yield table which makes possible more accurate metal-in-mold costs is illustrated.

■ **A338 . . "Fracture Test for Determining Melt Quality of 85-5-5-5 Red Brass," *American Foundryman*, vol. 24, no. 4, October 1953, pp. 68-69, 71.**

Procedure for determining melt quality and application of the information obtained with a three-minute fracture test are outlined. One page of article is designed to be removed and placed on bulletin board for easy reference.

■ **A339 . . "Shell Molding—What Does It Cost?" Walter W. Coleman, *Foundry*, vol. 81, no. 10, October 1953, pp. 156, 158, 190, 191, 192.**

Plus values that need to be considered in order to make shell molding profitable when the ratio of casting weight is over about 2½ are given. Considerations as to size of run, capital investment required, and causes of defective shells are briefed.

■ **A340 . . "The Foundry Quizmaster," *American Foundryman*, vol. 24, no. 4, October 1953, pp. 75, 81.**

Yellow brass practice is covered in 19 true-false questions with answers that tell why as well as what.

■ **A341 . . "Huge Cast Bronze Memorial to Honor U.S. Marine Corps," Pat Dwyer, *Foundry*, vol. 81, no. 10, October 1953, pp. 104-107, 208, 210, 212-213.**

Production of bronze statuary from sculptor's model, through full size plaster pattern, molding in French sand, to finished casting are described.

■ **A342 . . "Note on Mechanism of Second-Stage Malleablization," Floyd Brown, *Foundry*, vol. 81, no. 10, October 1953, pp. 108-109, 203, 205-207.**

Data on the mechanism of formation of the ferritic matrix during malleablization are given. The author reviews current theory regarding the mechanism of second-stage malleablization and concludes that a direct mechanism can take place in commercial practice.

■ **A343 . . "Quantitative Determination of Tungsten in Titanium," Maurice Codell, *American Foundryman*, vol. 24, no. 4, October 1953, pp. 72-74.**

Tungsten may be quantitatively determined in titanium metal using alpha benzoin oxime as the reagent, followed by digestion of the precipitate with ammonium hydroxide to dissolve tungsten. After filtration, ammonia is expelled by evaporation, and tungsten is finally precipitated as the oxide with aid of cinchonine solution after digestion with nitric and perchloric acids. A small quantity of molybdenum is added to carry down the last traces of tungsten during the alpha benzoin oxime precipitation. Any molybdenum which is carried down during the final tungstic oxide precipitation is determined colorimetrically and deducted from the final weight.

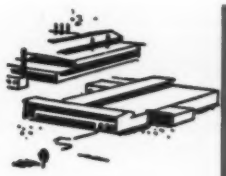
■ **A344 . . "Accelerated Training Program Pays Off," A. A. Erkkinen and D. J. Dresselhuys, *Foundry*, vol. 81, no. 10, October 1953, pp. 148, 150, 152, 154.**

Article compares results of accelerated training in comparison with apprentice training, walk-along training, and training within industry.

■ **A345 . . "Fused Die Castings," Herbert Chase, *Materials & Methods*, vol. 38, no. 4, October 1953, p. 119.**

Limited quantities of special die cast shapes can be produced at low cost using the fuse-cast technique. Example shows how process saved $19,000 in die costs.

These ACI type HH alloy annealing retorts (three on left) were centrifugally cast by Electro-Alloys Div., American Brake Shoe Co., and used to protect high-speed tool steel from combustion products in hood-type annealing furnaces. Containing 24-28 per cent chromium and 11-14 per cent nickel, alloy has high strength, ductility, and corrosion resistance at temperatures up to 2000 F. Seamless carbon steel pipes (2 on right) were formerly used, but scaling, loss in section thickness, and lack of symmetry were found, preventing stacking, causing loss of loading capacity, and necessitating use of firebrick and mud seals. The steel pipes were replaced every eight weeks, but the type HH alloy retorts have given excellent results for 3½ years, and at the present time are still in very good condition.



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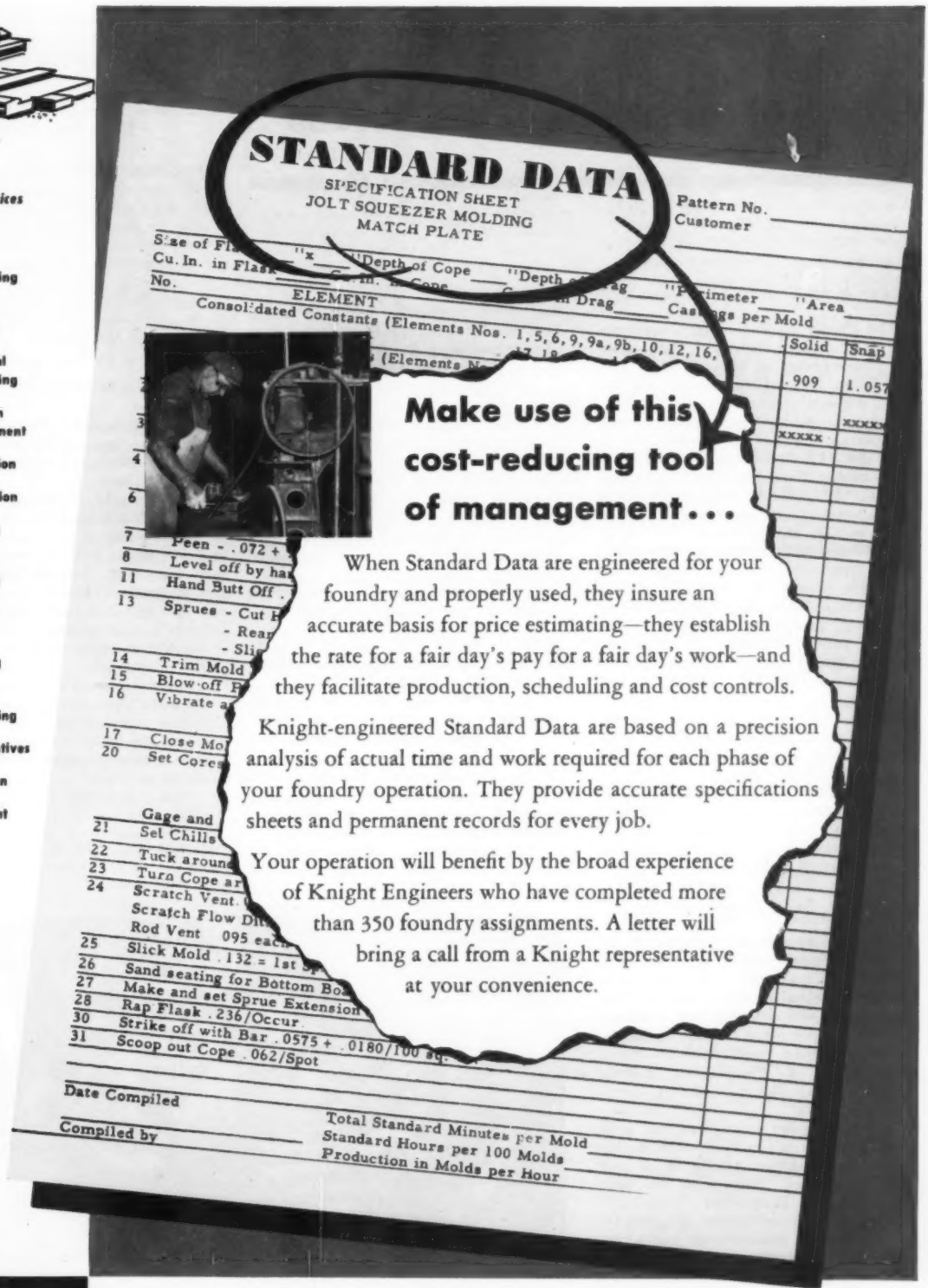

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News of Technical Committees

Plaster Mold Casting Committee

The Plaster Mold Casting Committee met in Chicago on October 2, 1953 under the chairmanship of H. Rosenthal, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia.

Principal subject for discussion was the participation of the Committee in the 1954 AFS Convention at Cleveland. Consensus of those members present was that the long-delayed symposium could be prepared by next May.

An outline was presented by Chairman Rosenthal including the following major topics: introduction, review of the literature, plaster formulations and handling techniques, design possibilities and potentials, specialized castings, production of rubber patterns and coreboxes, alloy selection and properties (aluminum, brass and bronze, magnesium), and bibliography.

Prospective authors and deadlines for Convention papers were discussed. Suggestions were submitted for new members for the Committee.

H. J. Heine, Acting AFS Technical Director, outlined the projected technical program for the 1954 Convention and reviewed Society policies regarding the presentation of papers.

Sand Division

Shop Course Committee. Chairman R. H. Olmsted, Whitehead Bros Co., Conneaut, Ohio, called the meeting to order at its Chicago session on November 13. Attendance at past meetings was discussed and suggestions made for new members. A vice-chairman was appointed unanimously: R. E. Fredrickson, Central Foundry Div., General Motors Corp., Saginaw, Mich.

It was proposed and agreed that a request be made to the Program & Papers Committee chairman, asking for an open meeting entitled "Report of the Sand Division to the Membership."

The Sand Shop Course program for the Convention was outlined and a tentative schedule for the technical program discussed. Personnel to comprise a panel of experts on sand control were proposed.

Next, the discussion centered on the type of questions that should be submitted to the panel. It was the consensus that casting finish should provide the general theme for the Division. It was moved and seconded that C. A. Sanders, American Colloid Co., Chicago, be appointed moderator for the meeting. He will prepare a list of questions and advise other committee members which have been selected for discussion at each of the three Shop Course sessions.

Educational Division

Executive, Program & Papers and Textbook Committees. Chairman W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind., announced that A. L. Hunt, National Bearing Div., American Brake Shoe Co., St. Louis, has been appointed as liaison between the AFS Board of Directors and the Educational Division.

Only two more chapters remain to be written in the College Foundry Textbook, being prepared at the University of Wisconsin by P. C. Rosenthal and R. W. Heine, both of whom were present.

Details of publishing, illustrating, and revision of the book were discussed by the committee members.

It was agreed that the Division will sponsor a luncheon instead of a dinner at the Convention, and possibly two technical sessions. Proposed topics were reviewed, along with other details connected with the annual meetings.

The newly-formed Management Information Committee was discussed and its objective of alerting management to the need for recruiting young people was delineated.

Gray Iron Division

Shop Course Committee. Meeting at Michigan State College on November 13, the Committee devoted most of its time to discussion of the three Shop Course sessions to be held at the Cleveland Convention. Chairman K. H. Priestley, Vassar Electroloy Products, Inc., Vassar, Mich., presided over the meeting, which approved a tentative program for each of the sessions.

Light Metals Division

Research Committee. This Light Metals committee met on October 28, 1953 at Battelle Memorial Institute, Columbus, Ohio.

Chairman W. E. Sicha, Aluminum Co. of America, Cleveland, reviewed the financial status of the Committee. A total of $23,000 in funds is available, contributed by AFS, Battelle Institute, and on contract with Frankford Arsenal. Previous decisions allocated the Arsenal funds for cost of experimental work, and the AFS-Battelle funds to cover cost of film preparation.

It was reported that alterations to No. 2 master film are now completed. Using motion picture illustrations, Battelle personnel described their recent work on vertical systems, demonstrating the scope of the problem.

The Committee decided to present a colored motion picture at the Convention, if possible. A January meeting will discuss progress in that direction.

Members of Steel Research Committee are shown in October 2 Chicago meeting. From left, seated: C. J. Zilch, Bucyrus-Erie Co., South Milwaukee, Wis.; H. J. Heine, Acting AFS Technical Director; C. H. Wyman, Chirman, Burnside Steel Foundry Co., Chicago; H. A. Young, Crane Co., Chicago; G. W. Johnson, Vanadium Corp. of America, Chicago; K. E. Fritz, Bucyrus-Erie Co., South Milwaukee, Wis.; Standing, from left: D. C. Zuege, Sivyer Steel Casting Co., Milwaukee; J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind.; F. S. Brewster, H. W. Dietert Co., Detroit; C. A. Faist, Burnside Steel Foundry, Chicago; and W. O. Igelman, National Malleable & Steel Casting Co., Melrose Park, Ill.

Foundry Tradenews

Allis-Chalmers Mfg. Co. has assumed operation of The Buda Co., Harvey, Ill. The company will be operated as The Buda Co., a division of Allis-Chalmers. Ralph K. Mangan, with Buda for 36 years and president since 1950, will be in charge of the division with the title of president and general manager. Located in suburban Chicago, there are two Buda plants, including more than 25 buildings occupying 654,446 sq ft and covering 28½ acres.

Dayton Malleable Iron Co., Dayton, Ohio, has purchased the Ohio Malleable Iron Co., Columbus, Ohio, and will operate it as a division. The plant was purchased from its parent firm, the Galion Iron Works and Mfg. Co., Galion, Ohio, which is a subsidiary of the Jeffrey Co. The Columbus plant is on an 18-acre tract, with buildings covering seven acres of the site and it produces malleable iron castings. Dayton Malleable plans to terminate all of its malleable iron production at Dayton and confine those activities to the Ironton and new Columbus plants. General direction of the new plant will be under L. J. Gallagher, a vice-president of the company and general manager of its Ironton plant. J. R. Kanengeiser, with Ohio Malleable under the former owners, will be assisting general manager.

Rockwell Manufacturing Co., has purchased the Callander Foundry and Manufacturing Co., Ltd., Guelph, Ontario. The firm will continue its operations under present management, using its present name, as a wholly-owned Rockwell subsidiary. W. W. Brydges, Callander president, will be president of the subsidiary company and W. F. Rockwell, Jr., will be chairman of the board of directors. Callander operates two adjoining plants at Guelph with a total of approximately 77,000 sq ft of floor space.

Lake Erie Engineering Corp., Buffalo, New York, has announced a newly created service by which industrial customers can purchase "packaged installations" of complete Lake Erie production equipment, set up in their plant, ready to operate. The plan is designed to eliminate piece-meal purchasing and the resultant divided responsibility.

Donegal Manufacturing Co., Marietta, Pa., has entered into a license agreement with the Armco Steel Corp. to produce DC-50 castings. Donegal DC-50 is essentially the same as the Armco 17-4 PH hardenable stainless alloy which previously has been produced in wrought form only. The alloy is hardenable and corrosion resistant.

The year 1954 will mark the celebration of the Golden Anniversary of **Pangborn Corp.**, Hagerstown, Md. Pangborn's facilities in Hagerstown include foundry, plate, sheet metal and machine shops, assembly plants, paint and woodworking shops. A series of events are being planned to celebrate the anniversary year culminating on September 1, 1954, the official birthday of the firm.

The new firm, **Baltimore Alloy Foundry, Inc.**, Baltimore, Md., poured its first casting November 30, 1953. The company will use ingots only, and alloy from base metals of which the true compositions will be known. Two #70, pit-type, gas-fired furnaces are in use.

Sipi Metals Corp., has opened a Cincinnati office and appointed Joseph H. Homan district manager. Salesmen for the Cincinnati district will be Louis P. Schweer and Joseph L. Homan.

Refractory Products Co., Evanston, Ill., has been made the exclusive sales agent for aluminum alloys, made by the **Wabash Smelting, Inc.**, Wabash, Ind., for the states of Michigan, Illinois and Wisconsin.

Earl E. Woodliff, foundry sand consultant, has recently purchased the building and adjoining properties at 14611 Fenkell (5-Mile Rd.), Detroit. The building has been the office and laboratory of Mr. Woodliff for the past ten years. The new properties will allow an expansion program to be undertaken in 1954.

Foundry Services, Inc., has moved its main office from 280 Madison Ave., New York, to larger quarters at 260 Madison Ave., New York. The company is one of a group of similar affiliated manufacturing companies in Canada, France, Germany, Italy, Spain, South Africa, Rodesia and England, together with branches or agents located in all industrial countries the world over.

The **Clifford Metal Sales Co.**, Providence, R. I., has been appointed distributor in Rhode Island for continuous-cast bronze products of the **American Smelting and Refining Co.**, Perth Amboy plant, Barber, N. J.

Builders Iron Foundry, Providence, R. I., has produced a four-page color bulletin, No. 100 K12, dealing with the production of castings by the shell mold process. The bulletin, called *"Better Castings By Shell Molding"*, contains pictures of various castings made by this method and comparative case histories of castings made by shell molding and by green sand molding.

Woodruff & Edwards, Inc., Elgin, Ill., has issued an eight-page colored brochure describing shell molding. The booklet illustrates the various steps in shell molding and shows several castings made by this process.

The products and applications of centrifugally cast heavy wall cylindrical stock, tubes and IPS pipe manufactured as ESCO Spuncast are described in a new booklet just released by **Electric Steel Foundry Co.**, Portland, Ore. The booklet points out that true centrifugal castings are pressure formed by the introduction of molten metal into rotating refractory faced molds. These are rotating at speeds which develop centrifugal forces many times that of gravity, thereby distributing and holding the metal against the mold wall until solidified.

S. E. Regional

continued from page 70

Mold Eqpt. Co.; Strickland Pattern Works; Tennessee Prods. Corp. Coke Plant and Southern Ferro Alloy Plant; United States Pipe & Foundry Co.; The Wheland Co.

1:30 pm: **Technical session,** Red Room
"Cobalt 60, A Foundry Tool," W. C. Jeffrey, Prof., University of Alabama, Tuscaloosa.
"F.E.F. Training Program at the University of Alabama," E. C. Wright, Prof., University of Alabama, Tuscaloosa.
Chairman: J. A. Lasater, Combustion Engineering Co., Inc., Chattanooga.

3:00 pm: **Technical session,** Red Room
"A Comparison of Present and Proposed Molding Machines," G. W. Merrefield, Giffels & Vallet, Inc., Detroit.
Chairman: D. B. Shannon, Somerville Iron Works, Chattanooga.

4:30 pm: **Technical session,** Red Room
"Gating," T. F. Kiley, Meehanite Metal Corp., New Rochelle, N. Y.
Chairman: P. H. Stuff, Ross-Meehan Foundries, Chattanooga.

7:00 pm: **Annual banquet,** Ballroom
Presiding: H. P. Delaney, Eureka Foundry Co., Chattanooga.
Invocation: R. F. Dykes, pastor, White Oak Baptist Church, Chattanooga.
"The Industrial Progress of the South," The Honorable Estes Kefauver, Senior United States Senator from Tennessee.
Toastmaster: H. F. Griscom, The Wheland Co., Chattanooga.

The Mystery of the Porous Bodies

...or how Chuck Wright makes a case hold water

"'TWAS on November 18 when Joe Sterm had his worst spell," began Chuck Wright.

Slowly lighting his briar, this Inco distributor foundry trouble-shooter asked, "Do you know Joe? He's Foundry Supt. of the Acme Pump Works. Well," continued Chuck, "Joe's wife told me the poor fellow tossed about in his bed night after night. But on November 18, she saw him throw his arms in front of his eyes, dive under the pillow and yell what sounded to her like, 'Eekers! Eekers!'

"Being a woman, she concluded Joe was in debt ... and in the clutches of a local loan shark. But she learned differently a few nights later when Joe drove me out to their place for dinner. Just a plain talk on how to cast different types of pump bodies made it clear that Joe's spell of nightmares came from leakers ... not 'Eekers.'

"Like many foundries doing similar work, Acme found it difficult to get close grained machinable parts without running different mixes to satisfy a wide variety of casting sizes and sections. And brother, you know what a half dozen different mixes mean in a shop.

"Joe has since cured his nightmares by a plan I gave him during that dinner. Now he standardizes on two base mixes. One base has a silicon level of 1.50% to 1.75%, and 3.00% to 3.10% carbon, the other a silicon level of 2.25% to 2.50% ... with total carbon about 3.40%. The lower silicon iron is used for heavier work while the higher silicon level takes care of the bulk of lighter castings. Where castings combine heavy and light sections, the addition of ½ to 1% nickel to the low silicon iron assures satisfactory machinability in the light sections and maintains a good close grain and pressure tightness in heavier sections of the same casting. For extremely light castings of uniform section, Joe uses the higher silicon base with nickel additions that vary from ½ to 1% ... to guarantee freedom from hard spots and unmachinable edges and corners.

"Joe now gets few unmachinable castings or leakers due to open grain. And Acme found that the savings effected by reduction of foundry and machine shop rejects has more than offset the cost of the nickel additions. Getting rid of machining costs on these defective castings is an important saving for the machine shop and one that will amount to a considerable figure.

"If anybody wants a cure for nightmares like Joe's ... drop me a line."

Chuck Wright

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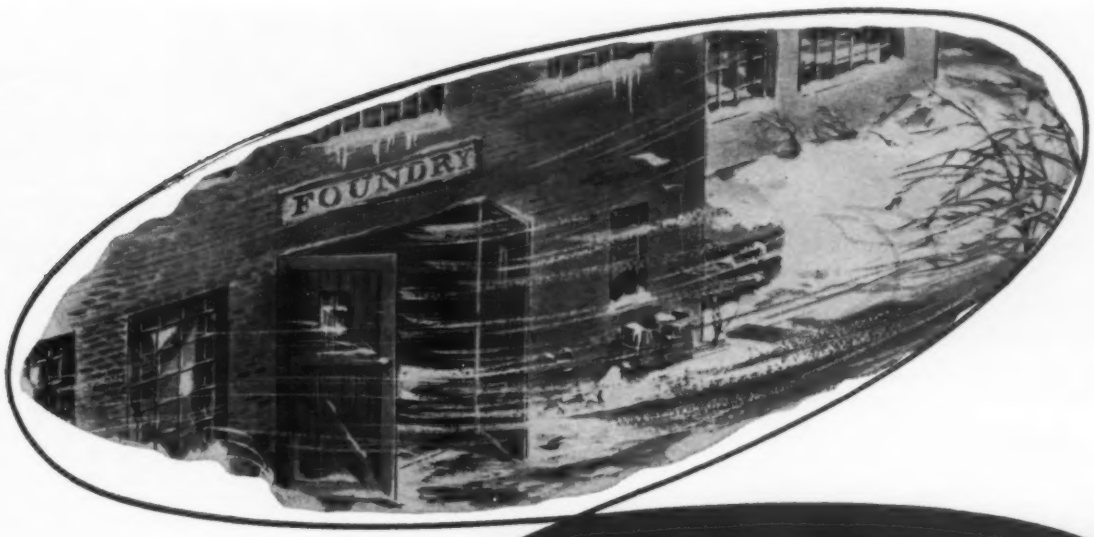

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Part of the group of the Northwestern Ohio Chapter making the tour of the Ford Motor Co. Cleveland Foundry, in November. Photo by T. W. Gallagher, Lake City Malleable Co.

Chapter News

634 Members Needed

With sights set on a membership of 12,000 by June 30, it appears that this goal will be reached long before then. Membership in the American Foundrymen's Society as of November 30, 1953, was 11,366. This leaves seven months for our membership chairmen to get the needed 634 new members to accomplish our goal. During November six new company members have been added to the rolls. They are:

COMPANY MEMBERS

Bendix Aviation Corp., Lakeshore Div., Stevensville, Mich.; Ladd C. Shramek, Fdy. Supt. (Michiana Chapter).

Dennison Pattern Works, Inc., Cleveland; Joseph Tomasi, Secty.-Treas. (Northeastern Ohio Chapter).

Mabry Foundry & Machine Co., Beaumont, Texas; Bob Mabry, Secty.-Treas. (Texas Chapter).

Motor & Machinery Castings Co., Detroit; Lloyd J. Barron, Secty. (Detroit Chapter).

Pattern & Eng. Co., Genesee Fdy., Flint, Mich.; Raymond H. Klawuhn, Mgr. (Saginaw Valley Chapter).

Sutter Products Co., Dearborn, Mich.; Raymond H. Sutter, Pres. (Detroit Chapter) Conversion from Personal.

Central Michigan

Prior to the November meeting of the Central Michigan Chapter a Board of Directors meeting convened to discuss Al Hensel's Educational Committee Report. It was decided that an attempt should be made to bring more towns into the educational project. At the regular meeting over 150 members and invited youngsters assembled at the Hart Hotel for the annual Youth Encouragement Night. Wally Weber, freshman coach from the University of Michigan, entertained the audience with his use of the English language as well as with the game films of the University of Michigan vs Pennsylvania football game. Following Mr. Weber, Arthur Clark, Ford Motor Co., presented a film, *"Technique for Tomorrow."—Bob Dodge.*

Wrong Man

In reporting the September meeting of the Central Michigan Chapter in the November issue of AMERICAN FOUNDRYMAN it was erroneously stated that Palmer Coombs was plant manager of Bendix Aviation Products Div., Bendix Corp., South Bend, Ind., and was guest speaker at the meeting.

Arthur T. Ruppe is plant manager of Bendix Products Div., Bendix Aviation Corp. He gave the talk; he showed the slides; he held the attention of the audience; he received the applause at the September meeting and now, he receives our apologies for the error. Sorry!

Corn Belt

On November 6, the Corn Belt Chapter honored one of its foremost charter members, Joe Elliot, foundry superintendent, Western Land Roller Co., Hastings, Neb. Mr. Elliot, 73, has had over 56 years of foundry experience and is still anxious to learn about new foundry techniques. Guest speaker for the evening was William Peterson, chief chemist, M. A. Bell Co.—*Ira Trachtenbarg.*

St. Louis District

Dr. Albert W. Schlechten, chairman of the Department of Metallurgical Engineering, Missouri School of Mines and Metallurgy, was guest speaker at the November meeting of the St. Louis Chapter. He gave an informative and humorous account of the metallurgical operations that he visited in Europe. He was one of two observers sent from the United States to accompany a group of European metallurgical experts who traveled through England, Sweden, Germany, Italy and France to study methods for utilizing low grade ores and to see what facilities were needed for research and training along these lines. R. E. Hard, St. Louis Coke and Foundry Supply Co., chairman of the Reception Committee, extended greetings to the visiting students and instructors of Missouri School of Mines.—*Jack Bodine.*

Northwestern Pennsylvania

Northwestern Pennsylvania Chapter held its October meeting in the Blue Room of the Erie Moose Club. Chairman, Charles Gottschalk, Cascade Foundry Co., presided. He announced the new members and that John Clark, General Electric Co., Charles Gottschalk, Cascade Foundry Co. and Earl Strick, Erie Malleable Iron Co., have been asked to serve on the advisory board for the new million dollar Technical High School to be built in Erie and which is to include a modern foundry practice in the school curriculum. Robert W. Jordan, Ajax Iron Works, showed a film, procured from Beardsley & Piper Co., Chicago, on the improvement of material handling in the foundry. Vice-Chairman, Bailey D. Herrington, Hick-

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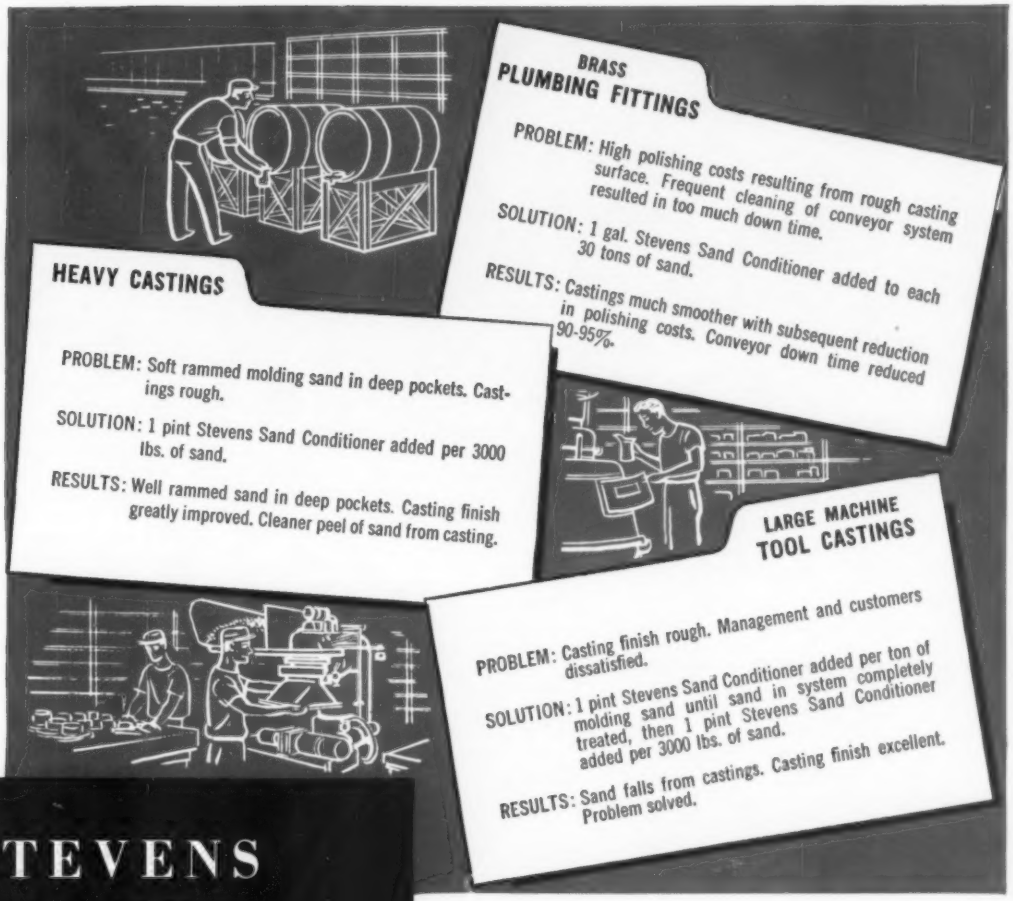
Engrossed in discussion at Central Illinois Chapter meeting are from left to right, A. V. Martens, Pekin Foundry & Mfg. Co.; O. H. Harer, Scientific Cast Products Corp.; Charles Arps, Allis-Chalmers Mfg. Co., and H. Felten, Peoria Malleable Castings Co.



BRASS PLUMBING FITTINGS

PROBLEM: High polishing costs resulting from rough casting surface. Frequent cleaning of conveyor system resulted in too much down time.

SOLUTION: 1 gal. Stevens Sand Conditioner added to each 30 tons of sand.

RESULTS: Castings much smoother with subsequent reduction in polishing costs. Conveyor down time reduced 90-95%.

HEAVY CASTINGS

PROBLEM: Soft rammed molding sand in deep pockets. Castings rough.

SOLUTION: 1 pint Stevens Sand Conditioner added per 3000 lbs. of sand.

RESULTS: Well rammed sand in deep pockets. Casting finish greatly improved. Cleaner peel of sand from casting.

LARGE MACHINE TOOL CASTINGS

PROBLEM: Casting finish rough. Management and customers dissatisfied.

SOLUTION: 1 pint Stevens Sand Conditioner added per ton of molding sand until sand in system completely treated, then 1 pint Stevens Sand Conditioner added per 3000 lbs. of sand.

RESULTS: Sand falls from castings. Casting finish excellent. Problem solved.

STEVENS SAND CONDITIONER

solves both mold and core production problems

These recent cases, taken from our files, show what Stevens Sand Conditioner has done to assure better castings for a few of the many satisfied Stevens customers. Here's how Stevens Sand Conditioner can help solve your core and mold production problems:

1. Increases flowability of core and molding sand to prevent soft rammed areas and pockets.
2. Cores draw easier from boxes, patterns draw easier from molding sand.
3. Improved casting finish on core and mold surfaces.
4. Sand peels better from castings.
5. Prevents sand from sticking in mullers, conveyors, hoppers and all sand handling equipment.

Get more facts about this non-toxic, low-cost Sand Conditioner today. Call your Stevens Sales Representative, or write direct for Stevens Technical Bulletin F 101. FREDERIC B. STEVENS, INC. Detroit 16, Mich.

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DETROIT 16, MICHIGAN

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Faculty members from the Missouri School of Mines and Metallurgy at the November meeting of the St. Louis Chapter, from left to right: A. Legsdin, professor of mineral dressing; R. V. Wolf, instructor, metallurgical engineering; A. W. Schlechten, chairman, Dept. of Metallurgical Engineering and guest speaker, and D. S. Eppelsheimer, professor, metallurgical engineering.

Chapter News

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man, Williams & Co., introduced J. Douglas James, Cooper-Bessemer, Corp., who in turn introduced Norman A. Birch, National Bearing Div., American Brake Shoe Co., the speaker whose subject was *"Principals of Gating and Risering."—Roy A. Loder.*

Texas

The Texas Chapter held a joint meeting in October with the Houston Chapter of the Non-Destructive Testing Society at Kaplans, Houston, Texas. A. L. Pace, General Electric Co., Milwaukee, spoke on *"More and Better Castings at Less Cost with X-Ray."* He illustrated his talk with slides.

The San Antonio Section of the Texas Chapter met November 16, at the Alamo Iron Works to see a film entitled *"Economical Shell Molding on Tyco Shell Molding Machine."* Alex Bearden, M. A. Bell Co., discussed the merits and operation of the machine.—*Wm. A. Bearden and Edw. W. Pruske.*

Tri-State

The November meeting of the Tri-State Chapter was held at the Blackwell Country Club, Blackwell, Okla. After a brief review of future meetings, D. W. McArthur, program chairman, Oklahoma Steel Castings, Inc., introduced W. M. Peterson, M. A. Bell Co., St. Louis, who presented the group of 60 members and guests with an off-the-shoulder dicussion entitled, *"Bake Cores While You Wait."* After discussing the problems encountered in experimentations with this process, Mr. Peterson pointed out ways of obtaining the best results. Acting program chairman for the meeting was Charles M. Diel, Acme Foundry & Machine Co.—*Ed O'Brien.*

Mo-Kan

The November meeting of the Mo-Kan Chapter was held at the Fairfax Airport Restaurant, Kansas City, Kan. A large attendance of members and guests heard W. M. Peterson, M. A. Bell Co., talk on *"Baked Cores While You Wait".—C. W. Boettcher.*

Ontario

Ontario Chapter held its November meeting at the William Pitt Hotel, Chatham, Ontario, with 125 members and guests attending. *"Sand, Metal or Men"* was the topic of Harry E. Gravlin, Jr., Ford Motor Co., Dearborn, Mich., guest speaker. Mr. Gravlin deplored the state of mind which tends to rate the foundry lower than other types of industry as a good place to work. We should be proud of our foundry affiliation, he said, and all the complexities it represents and this pride and enthusiasm should be made known to other industries at every opportunity. Alex Pirrie, Standard Sanitary and Dominion Radiator, Ltd., presided as president assisted by John Perkins, Ford Motor Co. of Canada, technical chairman and John Allan, Callander Foundry and Mfg. Co., Ltd.—*C. E. Maddick.*

Rochester

Prior to the November meeting of the Rochester Chapter, a Directors' meeting with AFS National Director Edward Hoenicke, Eaton Manufacturing Co., was held. Edward J. Baker, chairman for the Membership Committee reported the new members and stated that the Rochester Chapter will be over-the-top in members for the year. Speaker of the evening, Vernon H. Patterson, Climax Molybdenum Co., Detroit, spoke on *"The Metallurgy of Cast Iron."* Dividing his talk in four parts, Mr. Patterson with the aid of slides, informed the foundrymen of the metallurgy of iron. He stressed the importance of the design of the casting to be made; which in his opinion, was necessary for the quality of the casting to be produced.—*Herbert Stellwagen.*

Tennessee

The Tennessee Chapter held its November meeting at the Hotel Patten, Chattanooga, Tenn., with Chapter Chairman William P. Delaney, Sr., Eureka Foundry Co., presiding. Approximately 125 members and guests attended. William Ball, Jr., R. Lavin & Sons, Inc., spoke on *"Human Engineering."* He pointed out actual examples of the vast possibilities that are available in human engineering. Paul Arnold, U. S. Pipe & Foundry Co., and conference chairman, reported on plans for the Southeastern Regional Conference to be held February 18-19 in Chattanooga, Tenn.— *W. F. Hetzler.*

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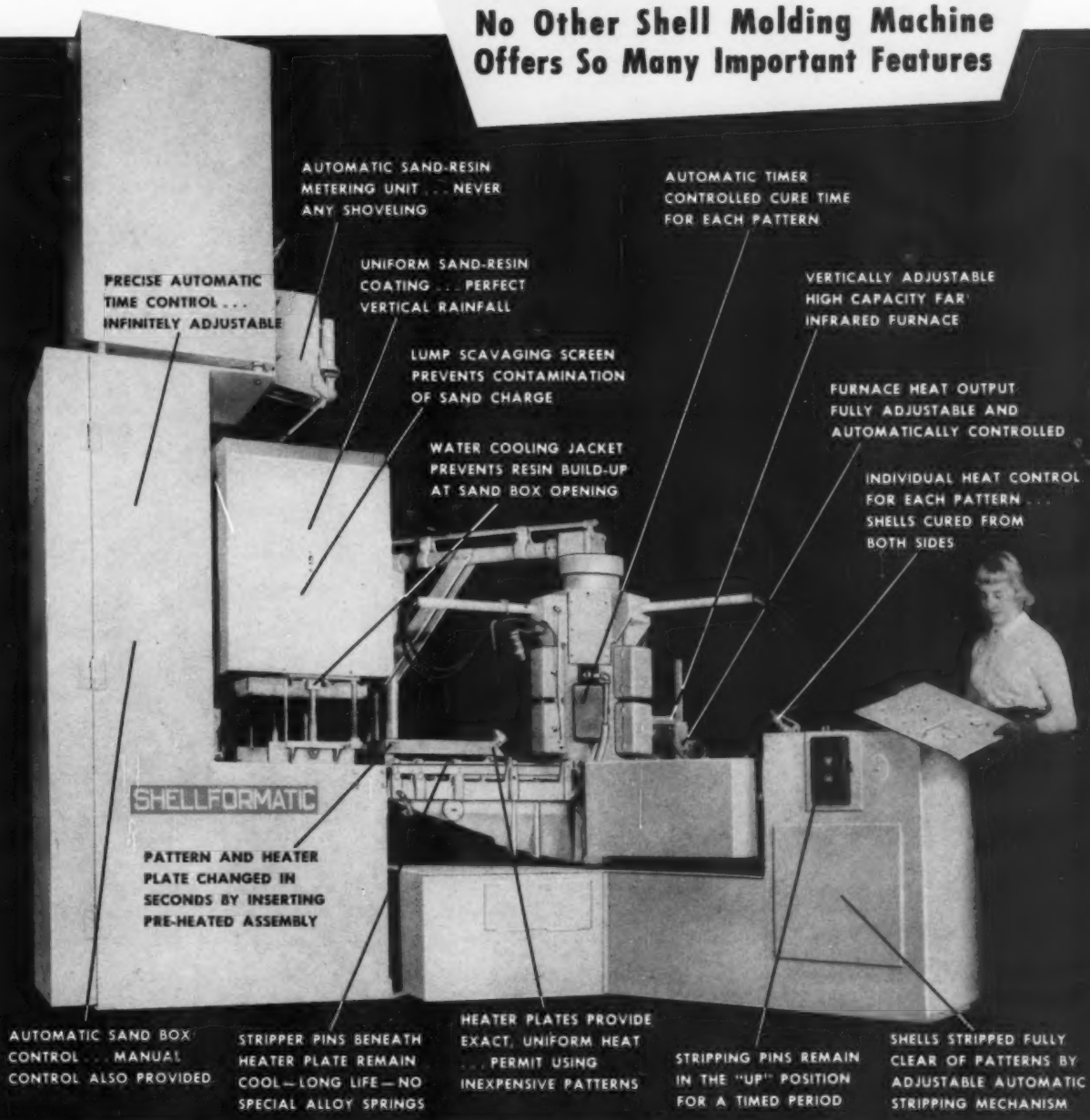
Attending the October meeting of the Tri-State Chapter are from left to right, seated, D. W. McArthur, vice-chairman, Oklahoma Steel Castings, Inc.; T. E. Barlow, guest speaker, International Minerals & Chemical Corp.; D. W. Harris, chairman, Frank Wheatley Pump & Valve Mfg.; R. F. Forsythe, treasurer, Big Four Foundry Co.; standing, Jack E. Gickler, acting chairman of the meeting, Missouri Steel Castings Co.; W. H. Mook, secretary, Bethlehem Supply Co., and Leo J. Masching, Frank Wheatley Pump & Valve Mfg.

NEW B&P Shellformatic

No Other Shell Molding Machine Offers So Many Important Features


AUTOMATIC SAND-RESIN METERING UNIT . . . NEVER ANY SHOVELING
AUTOMATIC TIMER CONTROLLED CURE TIME FOR EACH PATTERN
PRECISE AUTOMATIC TIME CONTROL . . . INFINITELY ADJUSTABLE
UNIFORM SAND-RESIN COATING . . . PERFECT VERTICAL RAINFALL
VERTICALLY ADJUSTABLE HIGH CAPACITY FAR INFRARED FURNACE
LUMP SCAVAGING SCREEN PREVENTS CONTAMINATION OF SAND CHARGE
FURNACE HEAT OUTPUT FULLY ADJUSTABLE AND AUTOMATICALLY CONTROLLED
WATER COOLING JACKET PREVENTS RESIN BUILD-UP AT SAND BOX OPENING
INDIVIDUAL HEAT CONTROL FOR EACH PATTERN . . . SHELLS CURED FROM BOTH SIDES
SHELLFORMATIC
PATTERN AND HEATER PLATE CHANGED IN SECONDS BY INSERTING PRE-HEATED ASSEMBLY
AUTOMATIC SAND BOX CONTROL . . . MANUAL CONTROL ALSO PROVIDED
STRIPPER PINS BENEATH HEATER PLATE REMAIN COOL—LONG LIFE—NO SPECIAL ALLOY SPRINGS
HEATER PLATES PROVIDE EXACT, UNIFORM HEAT . . . PERMIT USING INEXPENSIVE PATTERNS
STRIPPING PINS REMAIN IN THE "UP" POSITION FOR A TIMED PERIOD
SHELLS STRIPPED FULLY CLEAR OF PATTERNS BY ADJUSTABLE AUTOMATIC STRIPPING MECHANISM

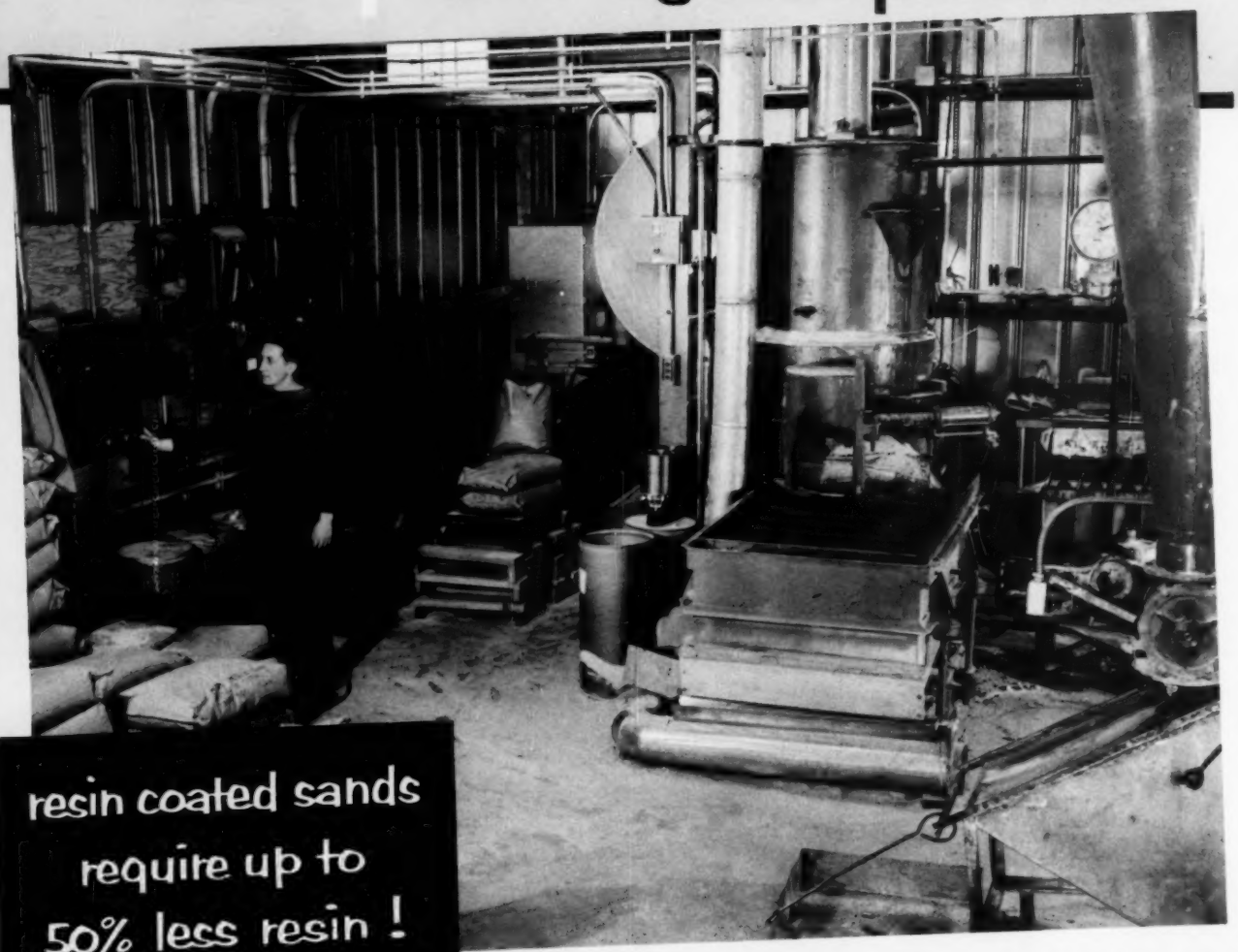
Now for the first time, a multiple station shell molding machine that offers full flexibility. Pattern changes are accomplished in less than a minute. Independent heat control and curing time control for each pattern provide flexibility that will permit the shell molding of many jobs that were never before within the range of this process.

For full information on Shellformatic single or multiple pattern types, and other advanced shell molding equipment, write to the Shell Mold Dept., *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39.*

Expert Shell Molding Consultation and Engineering Service Now Available Without Obligation

SHELL MOLDING SAND

Actually coated with resin by new process!



resin coated sands require up to 50% less resin !

Using a newly developed liquid resin instead of powdered resins, Beardsley & Piper engineers have perfected *the Special Speedmullor for the process of actually coating the sand grains with resin during mulling.* Because the resin is perfectly distributed through the sand in a uniform coating around the sand grains, up to 50% less resin is required for equal tensile strengths. Strength, permeability, and melting point are precisely controlled.

Resin coated sands are not dusty and, therefore, a health and safety hazard is eliminated. Coated sands may be handled with ease, with no danger of partial polymerization during storage. Since the resin actually coats the sand, there can be no resin segregation during storage or usage.

This new process is made possible by the design features of the Special Speedmullor. If you are interested in shell molding, you'll want information on the Special Speedmullor, resin coated sand process. Sand samples are available.

FOR FULL INFORMATION,
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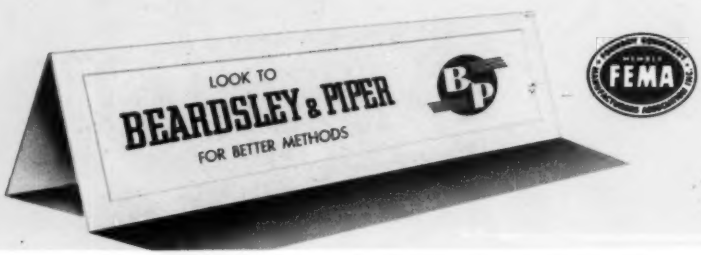

Chapter News

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AFS Past President W. L. Seelbach, Superior Foundry Inc., Cleveland, shown at the left was guest speaker at the October meeting of the Ontario Chapter. Chapter Chairman A. Pirrie, Sandard Sanitary & Dominion Radiator, Ltd., Toronto, is seated center and Vice-Chairman F. J. Rutherford, Refractories Engineering and Supplies, Ltd., Hamilton, is at the right.

Washington

R. W. McIlvaine, National Engineering Co., Chicago, spoke on *"Layout and Mechanization of Foundries"* at the November meeting of the Washington Chapter. The theme of this talk was that although the layouts and plans of mechanized installations may differ, the details for all are similar. Hopper design and gates on hoppers was analyzed and sketches were used to show improved design.—*E. F. Riedle and Harry E. Peltzer.*

Central New York

Central New York Chapter held its November meeting in the Roof Garden, Onendaga Hotel, Syracuse, N. Y. Chairman John A. Feola, Crouse-Hinds Co., presided and 93 members attended. Robert H. Zoller, Zoller Casting Co., was the speaker and his subject was *"Let Slag Be Your Refractory,"* or a new era in cuploa melting and quality control of product, through elimination of dampness; starting with hot cupola; tuyeres always open. Joseph Gibson, Sweets Foundry, Inc., led discussions following the talk. Harold Brakeman, City Pattern Shop, Inc., arranged a Pattern Maker Session with Cecil L. Sims, Sims Matchplate Co., the speaker. Pattern problems as applied to both foundries and pattern shops were discussed and a group of high precision castings made in plaster were displayed.—*Bruce R. Artz.*

Western Michigan

The November meeting of the Western Michigan Chapter was held at Fingers Restaurant, Grand Rapids, Mich., under the direction of J. A. Van Haver, Sealed Power Corp., assistant chairman. Colored slides of some of the chapter's summer picnics were shown, after which the group divided into two sections for the technical session. George P. Halliwell, director of research, H. Kramer & Co., Chicago, presented *"Non-Ferrous Foundry Practice"* to one group. The other group viewed the AFS film, *"Effect of Gating Design on Casting Quality."* At a meeting of the Board of Directors and Officers the resignation of Board Member George Turner was accepted. Mr. Turner's resignation was the result of the dissolution of the Paul Wiener Foundry Co. H. A. Deane, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., was elected to fill the vacancy.—*Wilson W. Hicks.*

Western New York

Donald L. Hayes, Laverack & Haines, Inc., was the guest speaker at the November meeting of the Western New York Chapter, held at the Sheraton Hotel, Buffalo, N. Y. His subject was *"Compensation Picture As Applicable to Foundry Industry."* In discussing compensation as it appears today, and particularly the future, Mr. Hayes listed three of the serious problems facing industry at present as follows: Silicosis, partial loss of hearing due to industrial noises and the increasing cost of compensation.—*R. E. Walsh.*

Twin-City

Students held the limelight at the November meeting of the Twin-City Chapter. Local universities and vocational schools were represented by 43 students and faculty. The meeting was planned and directed by the Educational Committee under the chairmanship of J. D. Johnson, Archer-Daniels-Midland Co. Donald B. Fulton, Northern Malleable Iron Co., directed the plans for the program. Hans J. Heine, Acting Technical Director, AFS, was guest speaker. His subject, *"The Fascination of the Foundry,"* was illustrated with slides showing the various phases of foundry work.—*R. J. Mulligan.*

Central Illinois

Doctor M. F. Broune, Barrett Div., Allied Chemical & Dye Corp., spoke on *"The Use of Plastics in the Foundry"* at the November meeting of the Central Illinois Chapter. He was introduced by Technical Chairman Arthur King, Brass Foundry Co. Dr. Broune stated that the use of resins in high pressure molding

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Attending the November meeting of the Chicago Chapter are from left to right, William Rudin, Elesco Smelting Corp.; Robert F. Dalton, Electronicast, Inc.; Kenneth P. Smith, Chicago Malleable Castings Co.; Earl E. Woodliff, guest speaker, Foundry Sand Service & Engineering Co.; Robert Aeberly, Electro Metallugical Co., and R. L. Doelman, Miller & Co.

Obituaries

William S. Miller, 65, vice-president and eastern manager of Charles C. Kawin Co., died suddenly in Buffalo, N. Y., in November. Mr. Miller had been with the firm approximately 35 years.

John T. Jones, 35, with the sales department of Vesuvius Crucible Co., Pittsburgh, Pa., died in Minneapolis, Minn., in November. Prior to his employment at Vesuvius, he was an electric steel furnace operator for Republic Steel Co. in Canton and Chicago.

Eugene G. Fauntleroy, 61, director and vice-president of Moline Malleable Iron Co., St. Charles, Ill., died suddenly in St. Luke's Hospital, Chicago, in November.

William C. Wine, 53, foundry superintendent for Sibley Machine and Foundry Corp., South Bend, Ind., died suddenly while vacationing in California. He was a member of AFS and had served on the National Committee to study casting defects.

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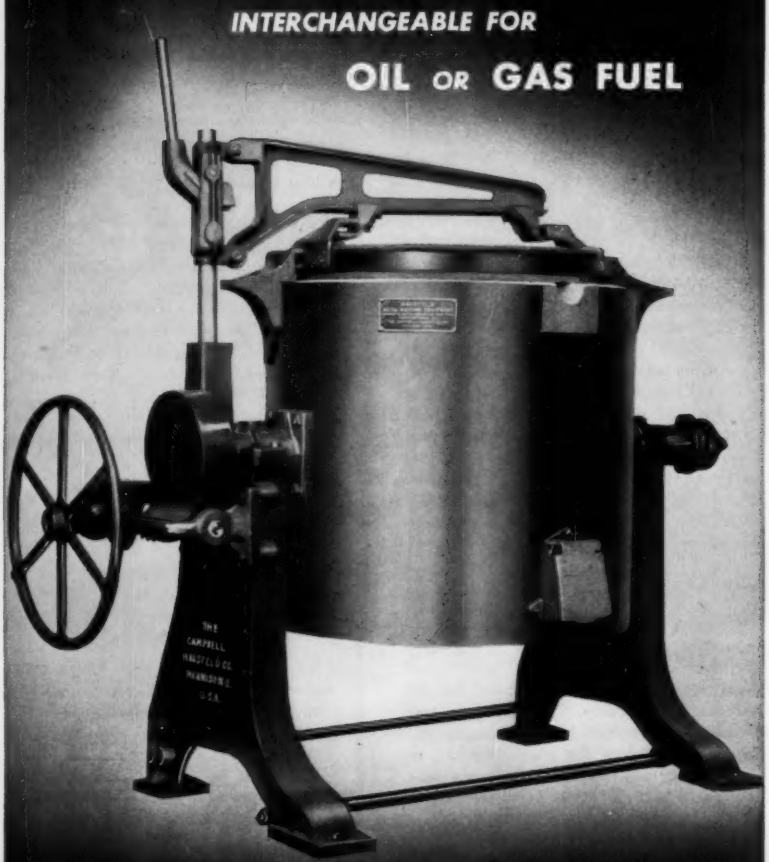
A FURNACE FOR EVERY NON-FERROUS MELTING REQUIREMENT

INTERCHANGEABLE FOR

OIL OR GAS FUEL



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The Campbell-Hausfeld Co.

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Vernon H. Patterson, left, Climax Molybdenum Co.; Edward Hoenicke, center, Eaton Mfg. Co., and Duncan Wilson, right, Engineered Castings Div., American Brake Shoe Co., discussing metallurgy of iron at the November meeting of the Rochester Chapter.

Chapter News

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promises to open up a new field. Samples of resin products were examined by members and guests following the talk. *—J. F. Dauzlarich.*

Eastern New York

A joint session with the Society of Capitol District Safety Engineers took place at the November meeting of the Eastern New York Chapter. Principal speaker was Frank J. Pouliott, senior representative of safety service of the State Insurance Fund. During his remarks, Mr. Pouliott stated that industry has gone a long way toward improvement by providing safer conditions and equipment, but that employees are lax in using such equipment to the fullest extent, with the result that the accident frequency rate is not as low as it should be.

Wisconsin

The general and sectional meetings of the Wisconsin Chapter were held November 13 and were attended by approximately 300 members. Martin A. Fladoes, Sivyer Steel Casting Co., National Director and member of the Executive Committee of AFS, and Wm. W. Ma-

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Honored at the November meeting of the Corn Belt Chapter was Joe Elliott, Western Land Roller Co., center. Left is William Peterson, M. A. Bell Co., guest speaker of the evening, and right is Earl White, chairman of the Corn Belt Chapter.

Veterans on the Production Front!

Sterling Style 36 HD-RT Special Flask showing cylinder block mold before cope was placed in position for pouring.

In Service 10 Years And Still Going Strong

The Sterling Heavy Duty Rolled Steel Flasks, shown above, have been producing cylinder block castings for Diesel engines in a Mid-west foundry for more than 10 years. And they are still going strong.

Sterling is the original and only ROLLED STEEL CHANNEL foundry flask. The heavy flanges with square corners and full-width bearing and the solid reinforcing bar around each section provide strength and rigidity to withstand tremendous pressures, year after year. Partings are accurately machined — not just surface ground, but planed to an accuracy of .005". The thick flanges have plenty of steel for several refinishings.

More than 4,500 foundries in America use Sterling Flasks . . . and every flask proves the Sterling ability to stand up, year after year, under rough foundry usage. Write for your copy of Foundry Equipment Catalog.

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General luncheon scene, left, and shell molding machine demonstration, right, two of the events occurring at the Northwest Regional Conference held October 16-17 in Seattle, Wash. Complete account of the conference appeared in the December issue of AMERICAN FOUNDRYMAN. Photos by Norman E. Hall, Electric Steel Foundry Co.

Chapter News

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loney, AFS Secretary-Treasurer, addressed the general assembly. They discussed the International Foundry Congress held in Paris in September. A. F. Pfeiffer, Allis-Chalmers Mfg. Co., chapter president made several announcements with reference to the coming three-day conference to be held in February, after which the meeting divided into the various sectional meetings.—*Walter R. Matschulat.*

Eastern Canada

James G. Dick, chief chemist and metallurgist, Canadian Bronze Co., Montreal, was the guest speaker at the November meeting of the Eastern Canada Chapter. The speaker discussed in general terms the amount of shrinkage as it occurred in molten metals over the period during which cooling takes place from the molten state to room temperature, and it was pointed out that this occurs in three distinct stages. The influence of alloy composition on the extent to which shrinkage takes place during the transition stage from liquid to solid was then discussed, reference being made to three general composition groupings, including the Eutectic alloy group, the solid solution alloy group and the Eutectic-solid solution alloy group. —*John L. Slater.*

University of Wisconsin

The Student Chapter of the University of Wisconsin has elected James H. Dance, president; Carl Loper, Jr., vice-president, and James Davies, Jr., secretary-treasurer. At the December 1 meeting, Jack Scales, Chain Belt Co., spoke on *"The Metallurgical Department and the Foundry"* and at the December 15 meeting, George Dreher, Waukesha Foundry Co., spoke on *"The 5-Star Man."* Harold Ruf, Grede Found-

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Officers and speakers pause between dinner and technical session of the Birmingham District Chapter. Left to right, Edwin E. Pollard, vice-chairman, Alabama Pipe Co.; Joseph S. Schumacher, speaker, Hill & Griffith Co.; Captain Homer Allen, coffee speaker, and Biddle W. Worthington, chairman, McWane Cast Iron Pipe Co. Photo by Edwin H. Phelps, American Cast Iron Pipe Co.

Save MAN HOURS and CASTINGS

1. Automatic Sand Tempering Unit

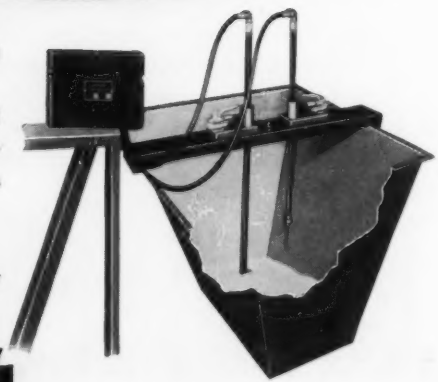
Automatically insures correctly tempered sand at the molders' hopper.

Measures exact moisture in return sand and adds required water to bring sand to temper.

Measures temperature of return sand and adds evaporation water required.

2. Hoppertrol

Automatically fills sand hoppers and bins by controlling plow action.



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Write for LITERATURE

Information

continued from page 18

Old Iron Furnaces

Beautiful 12-page booklet illustrates and describes some old iron furnaces of western Pennsylvania. A map showing the location of some of the ruins of the old furnaces is also included in the book. *United Oil Mfg. Co.*

For more data, circle No. 86, p. 18

Crucible Melting Furnaces

Bulletin No. 90 is devoted to stationary crucible melting furnaces for brass, bronze, aluminum and other alloys. Folder describes the modern design, linings, covers, fuel economy, oil burners, gas burners, Stroman blowers and Stroman Oil pumping units. *Stroman Furnace & Engineering Co.*

For more data, circle No. 87, p. 18

Protective Equipment

Catalog No. 27 telling what protective equipment to use and where it is now available. The 64-page book also describes super-safety lenses, cup-type goggles, face shields and many other safety items. *Chicago Eye Shield Co.*

For more data, circle No. 88, p. 18

Tractor Shovel

The Hough Model HR 4-wheel drive "Payloader" tractor-shovel is the subject of a new 16-page catalog which is now available. Profusely illustrated, it contains action views of this unusual 1 cu yd machine doing earth and material handling jobs for cities, counties, contractors, aggregate producers and industrial plants. *Frank G. Hough Co.*

For more data, circle No. 89, p. 18

Cut-Off Wheels

A complete revision of the booklet, *"Norton Cut-Off Wheels,"* is now available. The 36-page manual gives information on various types of cutting-off machines and abrasive cut-off wheels, their selection, application and proper usage; also various helpful tables for wheel selection and conversion of wheel speeds to feet per minute values. *Norton Company.*

For more data, circle No. 90, p. 18

Rare Earths

Progress report No. 1 entitled "Rare Earths in Iron and Steel Melting" is now available. The 8-page illustrated booklet tells the results of experimentation in the use of rare earths in the ferrous field. *Molybdenum Corp. of America.*

For more data, circle No. 91, p. 18

these MARTIN products for core box protection

PETERSON VIBROLATOR quietly moves materials from bins and hoppers. Always instant starting. No maintenance, no lubrication. "Vibra-Tak" pocket-size vibration meter available. Check dead spots on vibrated match plates, bins, hoppers.

"SAND ARRESTER TUBE"

Save cores and step up production. Guaranteed for 100,000 blows.

"HOLINER" BUSHINGS

Stop abrasion between blow plate and core box. Protect blow holes.

"PROTEXABOX" PINS

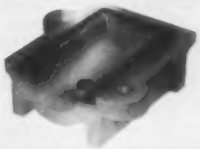
Cannot mar the box face because of protective rubber tip. Guaranteed to stay on.

"PULLINSERT" BLOW BUTTONS

Positively stop sand blasting under blow holes. Available in nine popular sizes.

"STRIPINSERT"

Protects parting line — easily installed in old or new boxes. Cutters for groove available at moderate cost.



NON-BINDING FLASK PINS

No production stoppages due to bending or binding of flask pins. Flexes and absorbs abuse, assures easy, perfect match.

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New Headquarters

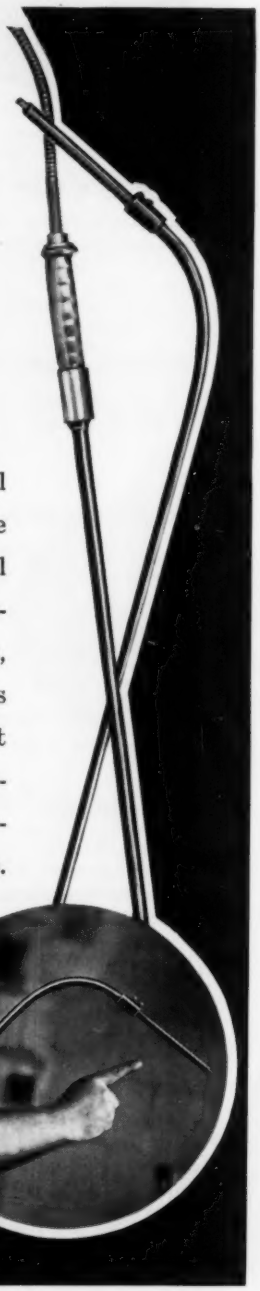
continued from page 49

Canadian Sumner Iron Works, Ltd., Vancouver, B. C., Canada
Cincinnati Foundry Co., Cincinnati
*Continental Foundry & Machine Co., East Chicago, Ind.
Cooper Alloy Foundry Co., Hillside, N. J.
Danko Pattern & Mfg. Co., Inc., Baltimore, Md.
Dayton Foundry, Hollydale, Calif.
*Decatur Casting Co., Decatur, Ind.
Delhi Foundry Sand Co., Cincinnati
Demmler & Bros., Wm., Kewanee, Ill.
*Dodge Steel Co., Philadelphia
*Electric Steel Castings Co., Indianapolis
Ensign Foundry Co., Toledo, Ohio
Exomet Inc., Conneaut, Ohio
Flynn & Emrich Co., Baltimore, Md.
Foundry Equipment Mfrs. Assn., Cleveland
Franklin Balmar Corp., Baltimore, Md.
Gale Mfg. Co., Albion, Mich.
Gartland Haswell Foundry Co., Sidney, Ohio
Georgia Iron Works Co., Augusta, Ga.
*Gilson Co., J. E., Port Washington, Wis.
Gordon Co., Claud S., Chicago
Hamilton Foundry & Machine Co., Hamilton, Ohio
Hamilton Foundry & Machine Co. Foundation, Hamilton, Ohio
*Herman Pneumatic Machine Co., Pittsburgh, Pa.
Hines Flask Co., Cleveland
Hitchiner Mfg. Co., Inc., Milford, N. H.
Hydro-Blast Corp., Chicago
Industrial Silica Corp., Youngstown, Ohio
Keokuk Steel Casting Co., Keokuk, Iowa
Lebanon Steel Foundry, Lebanon, Pa.
*Lectromelt Casting Co., Barberton, Ohio
Mastercraft Pattern Service, Huntington Park, Calif.
Maynard Electric Steel Casting Co., Milwaukee
*Mid-City Foundry Co., Milwaukee
*Moline Malleable Iron Co., St. Charles, Ill.
Monroe Steel Castings Co., Monroe, Mich.
Mountain States Steel Foundries, Inc., Parkersburg, W. Va.
*National Cash Register Co., Dayton, Ohio
National Engineering Co., Chicago
National Metal Abrasive Co., Cleveland
*Norton Co., Worcester, Mass.
*Oberdorfer Foundries, Inc., Syracuse, N. Y.
Reitinger, Harry, Beverly, N. J.
Saginaw Foundries Co., Saginaw, Mich.
Standard Foundry Co., Worcester, Mass.
*Stockham Valves & Fittings, Birmingham, Ala.
Superior Electrocast Foundry Co., South San Francisco, Calif.
Sutter Prods. Co., Dearborn, Mich.
Swedish Crucible Steel Co., Detroit
U. S. Reduction Co., East Chicago, Ind.
*Wagner Malleable Iron Co., Decatur, Ill.
Western Metal Abrasives Co., Cleveland

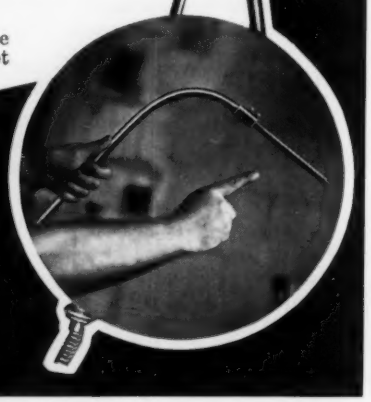
"It's too hot!"

"No, it's too cold!"

It is differing opinions like this that Marshall Enclosed-Tip Thermocouples remove from the nonferrous foundry! By the use of Marshall Thermocouples, the foundryman can tell exactly the temperature of his molten brass, bronze, aluminum or magnesium. He knows when his metals have reached the correct heat for pouring sound, dense, uniform castings. Write for descriptive data. L. H. Marshall Co. 270 W. Lane Ave., Columbus 2, Ohio.



Hot-junction tip of the thermocouple is protected against the action of hot metals and slag.



MARSHALL
THERMOCOUPLES

Foundry Apprentice Survey Planned by Labor Bureau

EVERY foundry in the United States will be covered in a survey to be carried out by the field staff of the Bureau of Apprenticeship, U. S. Department of Labor during the first quarter of 1954.

It is expected that data obtained will show areas where training is needed, in which categories; and indicate plants which have facilities for training of skilled workers, and discover causes for failure to train, where there is a need and where the facilities are available.

According to the Bureau, the foundry industry has been selected for attention because of its importance to the normal economy of the country, as well as its key position in national defense. Molders, coremakers and patternmakers are on the Labor Department's List of Critical Occupations.

Large volumes of castings are required for aircraft, tanks, and other military items, as well as for machine tools and other production equipment. During World War II, shortages of molders, coremakers and patternmakers were acute. Following the outbreak of Korean hostilities, these skilled workers were again in short supply.

The sharp increase in the output of castings for military production which would be required in full mobilization would again create shortages. The vital role of these workers in defense production and the probability of future shortages makes problems of training and retraining in the foundry of prime importance.

The Bureau of Labor Statistics estimates on the basis of a study made in 1952 than almost 9,000 molders and coremakers will die or retire in the next five years, and about 18,000 in the next decade. The very high death and retirement rate is resultant from the large proportion of these workers in the older age groups. Of the 1,800 workers interviewed during the survey, one-third were 55 years of age or older. Only 20 per cent were below 35 years of age.

The survey indicates that in the 1947-52 period, about 40 per cent of the new entrants were not apprentice-trained. No doubt many of these workers need additional training. Such training would increase the competence of this large group of men who are insufficiently trained in their jobs.

If the ratio of apprentice-trained journeymen to non-apprentice-trained workers should continue in the future, about 600 men would qualify each year without having served a formal apprenticeship. When this total is combined with those who complete apprenticeships, it is not enough to make up the expected losses from death and retirement.

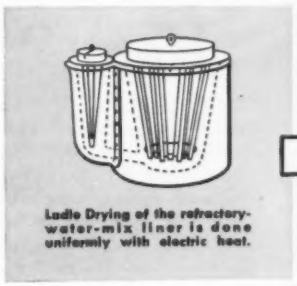
On the assumption that no major technological changes will take place in the near future, a substantial increase in the number of persons performing molding and coremaking work would be required under full mobilization. This condition may be met in part by breaking down the jobs and utilizing less skilled workers to act as supervisors.

It seems essential, therefore, that we have a sufficient nucleus of highly trained, all-around craftsmen to provide the base for the over-all increase in molding and coremaking manpower that would be required in emergency. To accomplish this goal, plans should be made in advance for training programs to provide both the additional skilled workers, and to use other workers by upgrading.

The Bureau of Labor Statistics study shows that apprentice trained workers were much more likely to get supervisory jobs and were capable of handling a greater variety of assignments. It was concluded that expansion of apprentice training is essential for the development of the all-around workers required.

Another CHROMALOX Production Tip

ELECTRIC HEAT UNIFORMLY DRIES LADLE LINERS



Ladle Drying of the refractory-water-mix liner is done uniformly with electric heat.

PROBLEM

Dry liners quickly and get ladles back into use; reduce rejects due to the uneven drying of the manually operated gasoline torch method on ladle liners; reduce the high man-hour cost of drying each of the ladle linings; make work area more comfortable.

SOLUTION

A standard, flange type Chromalox Electric Heater was mounted in a lifting lid and lowered into the ladle as heat was required. A small blower was installed to force air through ladle; another small tubular heater was installed in spout to do the same job.

ADVANTAGES

Automatic temperature controls assure even heat on all parts of the liner. Guesswork is eliminated, and exactly the right amount of heat is forced into the liner as required to dry it thoroughly. "By-product" advantages include the elimination of the hazards of open flame drying and cleaner, more comfortable working area.

CHROMALOX
Electric Heat for Modern Foundries

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THE MARK OF QUALITY — MARKAL

Chapter News

continued from page 88

ries, Inc., will speak on *"Nodular Iron Production"* at the January 5 meeting. The January 15 meeting entails a trip to Pelton Steel Castings Co.

Other topics in which students have expressed an interest are: Costing of Castings, Patterns, Gating Steel Castings, Safety and Hygiene in Foundries, Non-ferrous Foundry Applications, Castings Design, Foundry Sands for Cast Irons, Shell Molding, Core Sands and Core Making, and Inspection. At present, the student chapter has 27 participating members.—*Richard W. Heine.*

Central Indiana

The October meeting of the Central Indiana Chapter was held at the Indianapolis Athenaeum. Chairman Dallas Lunsford, Perfect Circle Co., presided and Technical Director T. W. Teetor, Swayne-Robinson & Co., introduced guest speaker Warner B. Bishop, Archer-Daniel-Midland Co., Foundry Products Div., who spoke on the "D" Process. In all of his discussion, Mr. Bishop was careful not to call this process a "cure-all," but stressed that it does have its applications, if properly used, that will give gratifying results.—*Wm. H. Faust.*

Attending the Texas Chapter meeting at the Menger Hotel, San Antonio, are from left to right: James R. Hewitt, Frank Roewer, Texaloy Foundry Co.; W. A. Raymond, Houston Foundry & Machine Co., and Israel Smith, Western Foundry Co.

Southern California

The November meeting of the Southern California Chapter was held at Rodger Young Auditorium and was attended by over 160 members and guests.

continued on page 94

Now, There's an Idea!

Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. "Now, There's an Idea!" helps *American Foundryman* readers promote the exchange of ideas, the motivating force behind the A.F.S. Contributions for publication are solicited. They may be of any length, preferably short, illustrated by photo or sketch.

■ Graphite crucibles too old for melting can still serve three useful purposes, according to Vaughan C. Reid, vice-president of City Pattern Foundry & Machine Co., Detroit. Sawed in half perpendicular to the vertical axis, a crucible becomes an ingot mold (bottom portion) for unpoured metal, and a hopper for a crucible in one of the company's lift-coil, high frequency induction furnaces. The hopper simplifies charging, particularly of long or bulky returns.

Skimmers are produced by sawing the side walls into vertical segments. A segment is mounted in a clamp at the end of a rod to form the complete skimmer. Such skimmers eliminate melt contamination which is possible with a metal skimmer. Because the old crucibles are well tempered through use, skimmer breakage due to thermal shock is eliminated.

An Important Message to the Man Who Asks:

"How Can I Increase Core Production?"

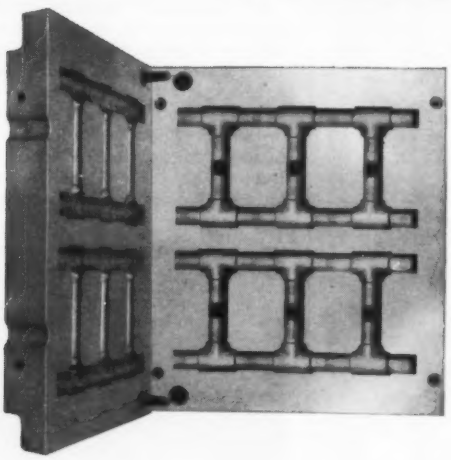
When you analyze the problem of increasing core production with your present equipment you must consider the core box itself. How much time do you lose annually with costly interruptions for core box repairs: in sampling and checking when new or repaired core boxes are put into production; and in scrapped cores because of worn cavities? Think of this time as *lost production!*

Now, see how Duplicast solves this problem for you: Because with Duplicast you find that core boxes are cheaper to replace than to repair you will have extra core boxes on hand at all times and there will be no lengthy interruptions of production schedules. No sampling or checking is necessary when a new Duplicast core box is put in production — just replace the new core box and start rolling. There'll be no fins in castings from a Duplicast core box because the accurate cavities are always *exactly* duplicated. You will realize a substantial reduction in scrap and in addition save up to 80% on core box replacement costs.

These are facts—reported by users of Duplicast from coast to coast. Wouldn't it be worth your while to investigate?

DUPLICAST

"The Expendable Core Box"



Duplicast is the ideal core box for high production schedules and for complicated irregular contoured shapes and cavities which otherwise are costly to replace or repair. Duplicast core boxes are made of a wear resistant aluminum alloy by a method in which a permanent hob, or mandrel, is used to duplicate any number of core boxes or dryers of exact dimensions within plus or minus .003 inches within a distance of 12 inches. Exact match on cavities can be held within plus or minus .001. Every Duplicast core box is produced with a mirror-like finish in the cavities without hand finishing or tooling of any kind.

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The KOOLHEAD 90°

The 90° bend under the head simplifies your operation and places the chill where it belongs. The "Koolhead 90°" will perform two duties: (1) a chill and (2) holding the sand on the surface of the mold. We feature clean, bright finished Horse Nails and can furnish the new bent head in any of the various "Koolhead" types.

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Membership

. . . AN INVESTMENT IN PROGRESS

"The man who does not keep closely in touch with his competitors in these days is likely to find himself far behind in the race. No man has a monopoly of the good ideas in any branch of industry, and there is no man who is so well informed, so thoroughly conversant with the details of his own business, that he can learn nothing by discussions with his fellow manufacturers. Those who know the most, those who are most progressive in their business, are most willing to acquire new ideas which will place them still further in the lead."

These thoughts formed the keynote of the A.F.S. Inaugural Meeting, in 1896 . . . today, in this era of keen competition, the wisdom is equally sound.

Membership in the American Foundrymen's Society continues to present unusual opportunities for making new friends throughout the foundry industry . . . through Committee service, Chapter meetings, and the annual Foundry Congress . . . friends with whom you can discuss a solution to common foundry problems.

AMERICAN FOUNDRYMEN'S SOCIETY
616 South Michigan Ave., Chicago 5, Illinois

Chapter News

continued from page 92

R. L. McIlvaine, National Engineering Co., Chicago, was guest speaker and his subject was *"Design Details of Sand Systems for Small Foundries."* He called attention to the fact that, in many of these systems, small but very important details are overlooked, which, in many cases, prove very costly in poor operation and high cost of maintenance. A discussion followed Mr. McIlvaine's talk. —*Otto H. Rosentreater.*

Birmingham

Over 100 foundrymen attended the November meeting of the Birmingham Chapter held at the Jefferson Davis Hotel, Anniston, Ala. Coffee speaker was Tom Sims, creator of "Popeye." Walter R. Jaeschke, Whiting Corp., was the technical speaker and his subject was *"Cupola Operation."* He was introduced by Harry Mouat, Whiting Corp. Donald E. Matthieu, membership committee chairman, Alabama Pipe Co., reported on the work of the committee and urged everyone to cooperate in helping to reach the goal of 400 members. In urging all members to attend all meetings to get the most out of their membership the slogan "Improve Yourself and Improve the Foundry Industry, Join the AFS Now" is being used.—*J. Pat McClendon.*

Other Organizations

Chicago Foundrymen's Association

At the annual meeting of the Chicago Foundrymen's Association held November 19, the following officers and director were elected: President, Carl A. Larson, Reliance Pattern Works; Vice-President, R. F. Grover, Love Brothers, Inc.; Secretary-Treasurer, C. V. Adams, Vulcan Iron Works; Director, Joseph Vilbig, Fox Valley Foundry Co. Mildred Kosar continues as Executive Secretary.

Shown at the November meeting of the Southern California Chapter are seated from left to right, Robert Gregg, American Meter Co., Inc.; R. L. McIlvaine, guest speaker, National Engineering Co.; Charles Gregg, Gregg Iron Foundry; standing, William C. Baud, Food Machinery Co., and H. W. Bowers, Rich Mfg. Company of Calif. Photo by K. F. Sheckler, Calmo Engineering Co.

Review 1953 Foundry Technical Developments

WITH the start of a new year, it is customary to look back in retrospect on the previous 12 months. Most significant developments in the foundry industry during 1953 would have to include the following:

- High pressure molding
- "D" process molding
- Shell molding
- Return of competition to the industry
- Nodular iron
- Foundry automation and mechanization
- Quality control
- Education
- Pearlitic malleable iron
- Air pollution and safety
- Increasing availability of specialized literature
- Automatic sand preparation
- Titanium casting
- Use of resin-bonded sand driers in dielectric core ovens
- Dielectric baking of cores on metal plates

Announce East Coast Regional Conference

SPONSORED by Metropolitan, Philadelphia, and Chesapeake Chapters of AFS, and with the latter group as host, the East Coast Regional Foundry Conference has been announced for March 19-20, 1954, at Philadelphia.

Chairman for the meeting will be W. H. Baer, Bureau of Ships, U. S. Navy, Washington, D. C. B. N. Ames, U. S. Naval shipyard, Brooklyn, will act as co-chairman. Other Conference officers are: secretary, D. A. Roemer, Franklin Belmar Corp., Baltimore; treasurer, H. E. Mandel, Pennsylvania Foundry Supply & Sand Co., Philadelphia; technical program chairman, F. G. Sefing, International Nickel Co., New York; and chairman on arrangements, J. M. Robb, Jr., Hickman, Williams & Co., Inc., Philadelphia.

The program for the Conference will be printed in an early issue of AMERICAN FOUNDRYMAN.

Shown attending the October meeting of the Southern California Chapter are from left to right, Arthur Rau, Snyder Foundry Supply Co.; Gordon Sondraker, Gordon Sondraker & Co.; Fred Dye, Burndy Engineering Co., Inc., and Paul Waters, South Gate Magnesium & Aluminum Castings Co. Photo by K. F. Scheckler, Calmo Engineering Co.

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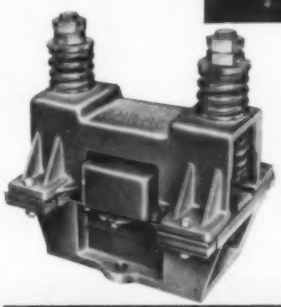
Pulsating Magnet
ELECTRIC VIBRATORS

Assuring steady flow of crushed stone from hopper to conveyor belt.



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b.		.002
a.		—
a.		.046
a.		.005
a.		.034
a.		.023
a.		.034
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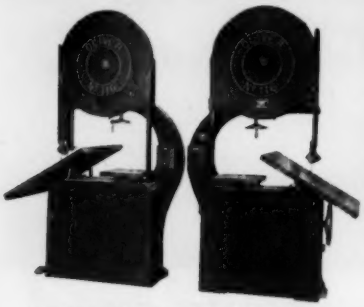
"OLIVER" left hand BAND SAW



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Chapter Meetings

January

4 . . Central Illinois
American Legion Hall, Peoria, Ill. W. S. Pellini, Naval Research Laboratory, "Heat Transfer as Applied to Castings."

4 . . Chicago
Chicago Bar Association, Chicago. Round Table. Malleable, B. C. Yearley, National Malleable & Steel Castings Co.; Steel, G. J. Grott, Unitcast Corp.; Non-Ferrous, Fred L. Riddell, H. Kramer & Co.; Maintenance, E. W. Greenlees, Kensington Steel Co.

4 . . Central Indiana
Athenaeum, Indianapolis. C. Schureman, Consultant, *"Foundry Sands."*

4 . . Western Michigan
Bill Stern's Restaurant, Muskegeon Heights, Mich. Howard Wilder, Vanadium Corp. of America, *"Cupola Practice Ferrous and Non-Ferrous."*

7 . . Saginaw Valley
Fischer's Hotel, Frankenmuth, Mich. J. H. Jackson, Battelle Memorial Institute, *"Casting of Titanium Alloys."*

7 . . Canton District
Canton Elks Club, Canton, Ohio. L. D. Richardson, Eutectic Welding Alloys Corp., *"Eutectic Welding."*

8 . . Wisconsin
Hotel Schroeder, Milwaukee. General Meeting.

9 . . Chesapeake
Alcazar Ballroom, Baltimore, Md. Annual Oyster Roast.

11 . . Metropolitan
Essex House, Newark, N. J. William S. Pellini, Naval Research Laboratory, *"Application of Chills to Increase Feeding Range of Risers."*

11 . . Michiana
Morris Park Country Club, South Bend, Ind. National Officers' Night. Split Meeting. Earl E. Woodliff, Foundry Sand Service Engineering Co., *"Sand Control Through Binder Selection."* Ted Stay, Reynolds Metal Co., *"Aluminum Foundry Practice."*

12 . . Twin City
The Covered Wagon, Minneapolis. Clyde A. Sanders, American Colloid Co., *"Sands."*

14 . . Northeastern Ohio
Tudor Arms Hotel, Cleveland. Warner Bishop, Archer-Daniels-Midland Co., *" 'D' Process Shell Molding."*

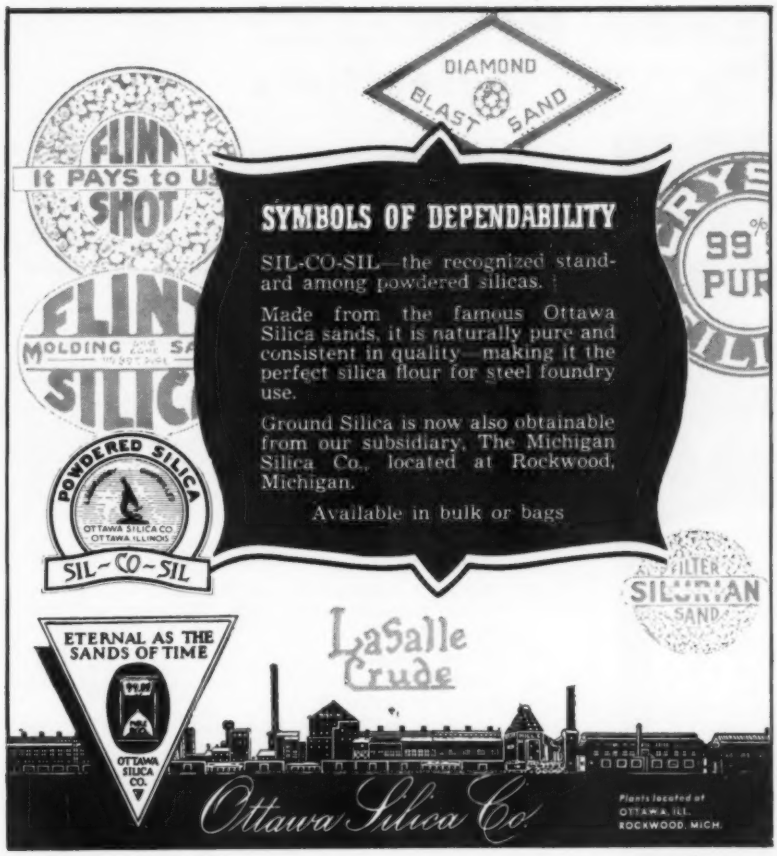
15 . . Philadelphia
Engineers Club, Philadelphia. C. V. Nass, Beardsley & Piper, Div. Pettibone Mulliken Corp., film, *"Mechanization in Coremaking and Molding."*

15 . . Birmingham
Tutwiler Hotel, Birmingham, Ala. E. T. Kindt, Kindt-Collins Co. "Pattern Engineering."

15 . . Tri-State
Tulsa, Okla. W. A. Hambley, Chas. A. Krause Milling Co. "Analyzing a Casting Defect—Blows vs. Shrinks."

15 . . Texas
Dallas, Texas. Hiram Brown, Solar Aircraft Co., "Light Metal Castings."

15 . . Mid-South
Chisca Hotel, Memphis, Tenn. J. B. Caine, Technical Consultant, "Risering."



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for Better Melting

Chapter Meetings

18 . . Quad-City
Fort Armstrong Hotel, Rock Island, Ill. Panel Discussion.

20 . . Central Michigan
Hart Hotel, Battle Creek, Mich. Howard Wilder, Vanadium Corp. of America, *"Cupola Operation."*

20 . . Oregon
Heathman Hotel, Portland, Oregon. E. J. McAfee, Puget Sound Naval Shipyard, *"Plastic Patterns."*

21 . . Detroit
Detroit Leland Hotel, Detroit. National Officers' Night. Harry McMurray, Ford Motor Co., *"New Equipment for Foundries."*

25 . . Northwestern Pennsylvania
Moose Club, Erie, Pa. Lawrence D. Pridmore, International Molding Machine Co., *"Core and Mold Blowing."*

29 . . Ontario
Royal Hotel, Guelph, Ont. Plant Visits and Group Meeting.

29 . . Chesapeake
Engineers Club, Baltimore, Md. H. S. Simpson, Caterpillar Tractor Co. "Safety as It Relates to the Foundry."

February

1 . . Chicago
Chicago Bar Association, Chicago. National Officers Night. William S. Pellini, Naval Research Laboratory, "Feeding Range of Risers."

1 . . Central Indiana
Anthenaeum, Indianapolis. Wm. Ball, Jr., R. Lavin & Son, Inc. "Effective Essentials To Make Good Castings."

1 . . Western Michigan
Cottage Inn, Muskegon, Mich. Harry Kesseler, Sobro-Mat Process Engineers, "Gating Practice."

1 . . Metropolitan
Essex House, Newark, N. J. Panel Discussion, Shell Molding; W. A. Sokolosky, Monsanto Chemical Co.; E. H. Rubowitz, Newark Pattern Works; Ray Olson, Production Pattern & Foundry Co.

1 . . Central Illinois
American Legion Hall, Peoria, Ill. D. Van Order, Burnside Steel Foundry, "Time Study Methods."

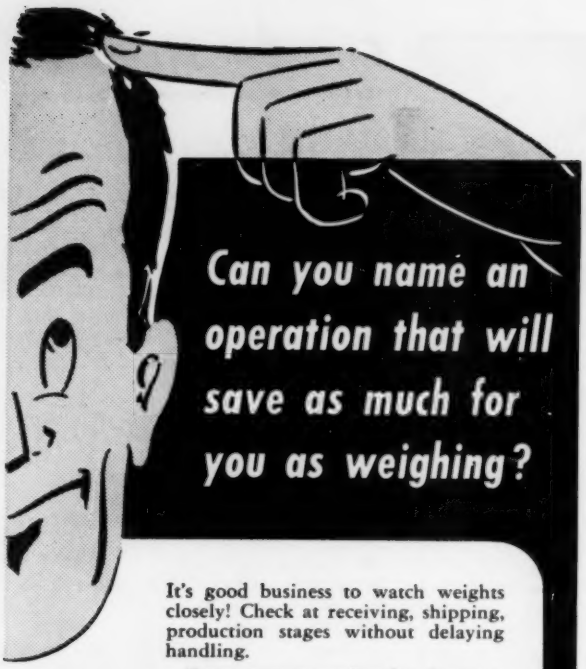
4 . . Canton District
Barberton Elks Club, Barberton, Ohio. Thomas Seaton, American Silica Sand Co., Ottawa, Ill., "Picture and Discussion on A Grain of Sand."

4 . . Saginaw Valley
Fisher's Hotel, Frankenmuth, Mich. Annual Ladies' Night. Dr. K. McFarland, GMC Consultant.

8 . . Rochester
Chamber of Commerce. Joint Meeting with I.M.C., A.E.S., and A.W.S. J. E. Burke, General Electric Co., "Metallurgical Problems in Atomic Power."

8 . . Michiana
Morris Park Country Club, South Bend, Ind. Joint Meeting. R. L. McIlvaine, National Engineering Co., "Foundry Mechanism."

9 . . Twin City
Covered Wagon, Minneapolis, Minn. Otto R. Harer, Scientific Cast Products Corp., "Pattern Trends." Film, "Pressure Cast Match Plates."



It's good business to watch weights closely! Check at receiving, shipping, production stages without delaying handling.

Put a stop to paying for dunnage, inaccuracies, other's miscalculations that rob you of your profit. Weigh loads as you lift them to move them by crane or hoist. Speed inventories, eliminate labor and equipment tie-ups at the weighing station.

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36 models
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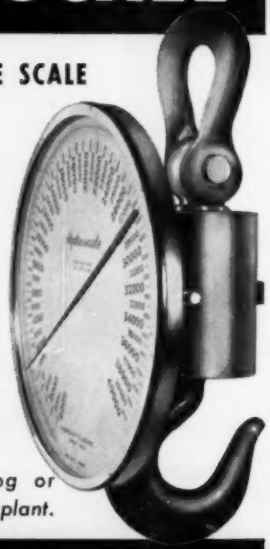
Batching models indicate pour-off



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SUPERVISOR—Brass Foundry Foreman. Experienced in solid and snap flask molding. Must have ability to handle men. **Box B3, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

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Leading, progressive, Precision Investment Casting concern offers outstanding opportunity for capable metallurgist with High Temperature Alloys experience. Radiographic and Customer Contact experience helpful. TOP SALARY.

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SALES ENGINEER—Major core oil manufacturer seeks qualified sand technician, age 25 to 38, for core oil sales and service, Dayton-Indianapolis-Chicago and adjacent area. Straight salary, all business expenses, full employee benefits. Write giving qualifications. PENOLA OIL COMPANY, Dept. 29, 3780 Penobscot Bldg., Detroit 26, Mich.

SALESMAN—Excellent opportunity for energetic man in sales and servicing of super refractory products. Previous selling or plant experience desirable. Position permanent. Well established concern. Give complete history and references. **Box B2, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOREMAN—Malleable foundry supervisor. Experienced with machine floor molding. High production. Must be able to handle men. **Box B4, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave.,**

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GRAY IRON FOUNDRYMAN AVAILABLE. Desire to relocate. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and gray iron metallurgy. Sixteen years in present executive position. Middle aged. **Box B5, AMERICAN FOUNDRYMAN, 616 South Michigan Ave., Chicago 5, Ill.**

FOUNDRIES FOR SALE

FOR SALE OR LEASE . . . Gray Iron—Aluminum—Bronze FOUNDRY
17,000 square-foot building is 80′ x 210′ on 5 acres with railroad spur. Complete with modern production equipment. Six-ton capacity cupola—200 tons per month. Present owner can use 25% to 50% of production. Selling to concentrate on primary business of manufacturing. Immediate occupancy. Contact Frank Wheatley, Jr., Frank Wheatley Pump & Valve Mfr., Hale Station, Sand Springs Road, Tulsa, Okla.

For Sale

Non-ferrous metal foundry business, plants and building on 100′ by 100′ lots, established over 30 years. Volume over 200,000 in metropolitan area of New York. Will consider active partner for 50% interest. **Box B1, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOR SALE

FOR SALE

Very reasonable and in good condition

1 TABLAST SAND BLASTING MACHINE

MODEL No. BM66900

Manufactured by American Wheelabrator Co., Mishawaka, Ind.

NORTHERN INDIANA STEEL SUPPLY CO., INC.

Michigan City Ind.

ONE ONLY CHAMPION CB-18 CORE BLOWER. Equipped with airtank, vibrating sand hopper and roller conveyor table. Never used.

JAS. H. MATTHEWS & CO.,
1315 W. Liberty Ave., Pittsburgh 26, Pa.

BRASS MELTING FURNACE, "REDA", for sale, 550# capacity, gas or oil, with extra set of refractory lining. Unit used less than 30 days, excellent condition. Wire your best offer.

RED JACKET MFG. CO.
Davenport Iowa

FOR SALE
6000 LB. HERMAN ROLLOVER & DRAW

Will handle 42″ x 60″ flasks 49″ between turnover plate and draw piston equalizer.

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MOTIVE JR. SANDSLINGER

Over-all height 15′ 8¼″
440 V 60 cycle machine
19″ ramming head
15′ ramming radius

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Both bought in 1948

E. W. BLISS CO.
TOLEDO DIV. - FOUNDRY
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Furnaces for Sale

Ten used heat treating furnaces and two seven ton gantry cranes. Good condition. Priced to sell.

Baer Steel Products, Inc.
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LARGE WHEELABRATOR — Wanted.
Must be in good condition.

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OHIO FERRO-ALLOY BRIQUETS WILL SAVE MONEY FOR YOU!

Foundries Can Slice Costs 7½ to 12% With Briquets

By utilizing Ohio Ferro-Alloy briquets you can use more scrap and less pig iron in your cupola. Cost of the charge is materially reduced, especially today when the relative cost of scrap to pig iron is so favorable.

Consider the tables below comparing a typical 1000 pound charge high in pig iron content with that utilizing silicon briquets and increased cast scrap.

Based on current delivered prices, the Ohio Ferro-Alloys briquet mixture represents a saving of 7.5% in Pittsburgh, 10.4% at Chicago, and 12.1% at Philadelphia.

In addition, Ohio Ferro-Alloy briquets can help you make better

Ohio Ferro-Alloy briquets are shipped to suit your handling facilities—bulk, bag, box type pallet, gondola or box car.

casting—reduce losses from off-iron. Easy to add to the charge at the cupola, briquets permit close and consistent metallurgical control. Such flexible control results in iron of enhanced physical properties—higher strength, more uniform structure, and better machinability.

Regular use of Ohio Ferro-Alloy briquets permits substantial

Cut Your Pig Iron Needs And Use More Scrap

reduction in raw material inventories. They may be purchased in any quantity from a bag to a carload and are available for prompt shipment packed in bags, in bulk, or in box type pallets at no extra charge.

COLOR CODED FOR EASY IDENTIFICATION

Color coded for easy identification, briquets of silicon, manganese, silico-manganese and chromium afford you a very effective method of trimming production costs and increasing the efficiency of your operation.

It will pay you to investigate the use of Ohio Ferro-Alloy briquets—for better iron at lower cost. Write us today for details.

PIG IRON MIXTURE

MATERIAL	Weight Pounds	% of Charge	SILICON		COST*		
			Per cent	Weight Pounds	Pittsburgh	Chicago	Philadelphia
Pig Iron	400	40.0	2.00	8.00	$10.08	$10.08	$10.44
Returned Scrap	300	30.0	2.20	6.60	5.08	4.55	4.68
Purchased* Scrap	240	24.0	1.60	3.84	4.07	3.64	3.75
Silvery Iron	60	6.0	10.25	6.15	2.01	2.08	2.48
Totals	1000	100.0		24.59	$21.24	$20.35	$21.35
Less Melting Loss, 10%				2.46			
Balance				22.13			

Theoretical Analysis of Iron 2.21% Silicon.

BRIQUET MIXTURE

MATERIAL	Weight Pounds	% of Charge	SILICON		COST*		
			Per cent	Weight Pounds	Pittsburgh	Chicago	Philadelphia
Pig Iron	200	20.0	2.00	4.00	$ 5.04	$ 5.04	$ 5.22
Returned Scrap	300	30.0	2.20	6.60	5.08	4.55	4.68
Purchased* Scrap	500	50.0	1.60	8.00	8.48	7.59	7.82
Six Silicon Briquets weighing 15 lbs. containing one lb. Silicon each				6.00	1.04	1.04	1.04
Totals	1000	100.0		24.60	$19.64	$18.22	$18.76
Less Melting Loss, 10%				2.46			
Balance				22.14			

Theoretical Analysis of Iron 2.21% Silicon.

*Based on delivered price per gross ton at destination as of Nov. 15, 1953. Returned and purchased scrap priced at cost No. 1 cupola grade.

Eliminate tedious and uncertain weighing — with briquets there's no more guesswork. Simply count out the number you need and toss them into the cupola. Notched briquets available for easy halving.

PHILO BRAND · BRILLIANT BRAND · TACOMA BRAND

Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh Tacoma Seattle
Minneapolis Birmingham San Francisco Los Angeles

the fastest-moving line in the Foundry Field...

for greater efficiency at lower cost

ADM keeps pace with the foundry industry by anticipating its needs through never-ending research. Proof lies in the fact that more than half the core binders consumed in American foundries are made by ADM. Furthermore, foundrymen know they can rely on ADM for absolute uniformity . . . and service second to none.

on its way to you . . . . from ONE SOURCE!

Archer **LIN•O•CEL** is the most effective sand stabilizer available. It improves flowability, which in turn, produces better tolerance and definition. Because LIN-O-CEL compensates for sand expansion, it stops rat-tails, buckles, and scabs which normally might occur due to denser rams made possible by improved flowability.

LINOIL, the most-used core oil in America, produces stronger cores at less cost. You can find among the seven grades of "700 LINOILS", for instance, an oil practically tailor-made to your core requirements. Whatever the grade selected, you can depend upon uniformity from shipment to shipment.

INDUCTOL, the new pre-baked core oil, bakes in half the time required for conventional oils. It bakes over a wide temperature range and resists over-baking so that large and small cores can be successfully baked at the same time. INDUCTOL produces considerably less gas than most core oils.

FREFLO is used two ways: (1) As a core sand conditioning agent to reduce stickiness and improve workability. (¼ of 1% by weight should be added during the final 30 seconds of mixing.) (2) As a parting compound for metal molding patterns. FREFLO is a great aid in modern, high-speed equipment.

The most recent addition to the ADM line is **ADMIREZ** resin binders. Available in urea and phenol formaldehyde types in both liquid and powdered forms for cores. Phenol type also available in powdered form for "C" (or shell molding) process.

STOP!

Whether or not you are using ADM foundry products, it pays periodically to check your core mixture. Proper use of any material will save you production dollars. Your LINOIL man can assist you in analyzing your specific core problems. He is backed by fully equipped laboratories, experienced ADM chemists, and foundry technicians who will analyze your problems upon request.

WHEREVER YOUR FOUNDRY IS LOCATED, there is an ADM office close by. Contact the one in your locality for full details on the fastest-moving line in the foundry field. Addresses are listed here.

COLORADO
Denver 2,
1732 Blake Street

ILLINOIS
Chicago 22,
927 Blackhawk St.
Rock Island
3847 28th Avenue

INDIANA
Indianapolis 4,
18 S. New Jersey St.

KANSAS
Kansas City 2,
1721 Minnesota Ave.

MASSACHUSETTS
Boston 9,
141 Milk Street

MICHIGAN
Detroit 35,
19755 James
Couzens Highway

MINNESOTA
Minneapolis 2,
600 Roanoke Bldg.

MISSOURI
St. Louis 19,
No. 2 Armin

NEW YORK
Buffalo 3,
1142 Marine Trust
Building
New York 7,
9th Floor, Woolworth
Building

OHIO
Columbus 15,
1935 LeVeque
Lincoln Tower
Toledo 5,
1152 East Broadway

PENNSYLVANIA
Lancaster
Manheim Pike and
Keller Avenue
P.O. Box 1412

PENNSYLVANIA
Philadelphia 7,
12 South 12th St.

WISCONSIN
Milwaukee 16,
3003 W. Hopkins St.

CANADA
Montreal 1,
432 Ontario Street, W.
Toronto 10,
200 Fairbank Ave.
Vancouver
2845 Grandview Hy.

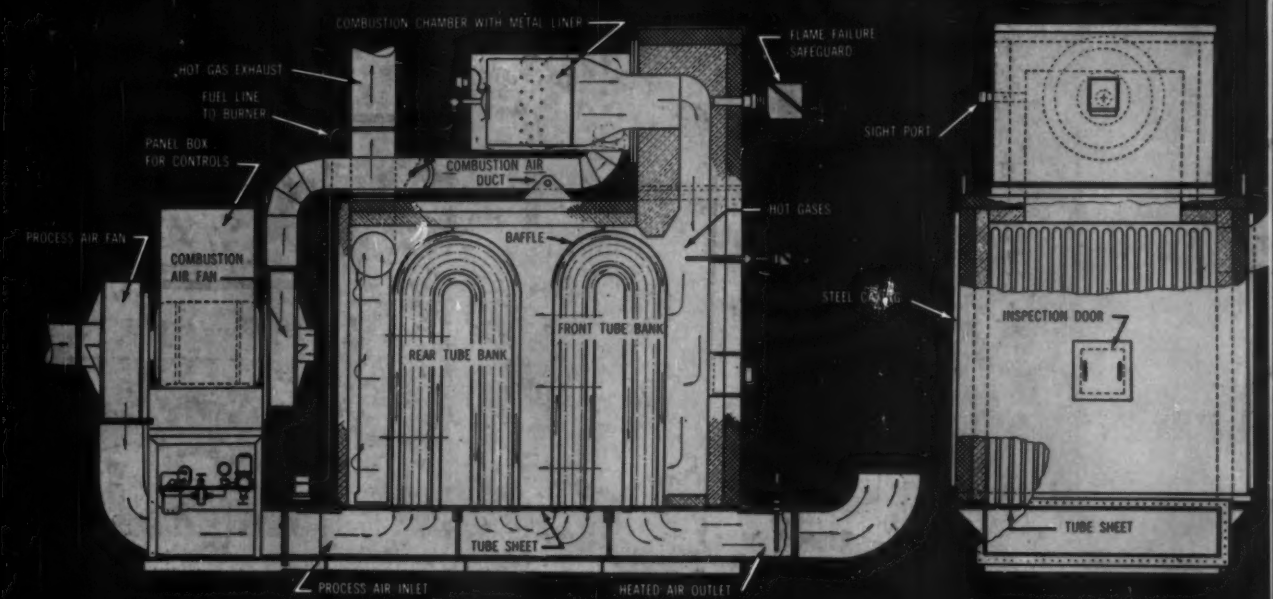
EXPORT
New York 7,
9th Floor, Woolworth
Building

ARCHER · DANIELS · MIDLAND COMPANY

FOUNDRY PRODUCTS DIVISION • 2191 WEST 110TH STREET • CLEVELAND 2, OHIO

WHITING

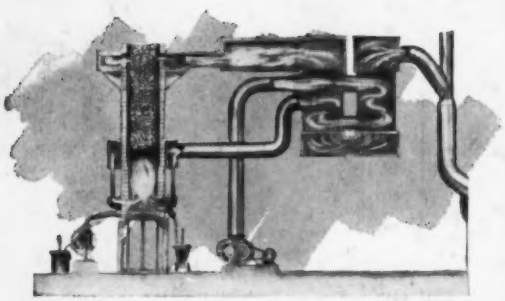
USE HOT BLAST



SIDE SECTIONAL VIEW

END VIEW

Todd-Thermo Process . . . Oil or gas is used to preheat the blast. Particularly useful for short heats, since preheated air is available right from the beginning of the heat.



Griffin Hot Blast System . . . Incompletely burned gas from the stack of the cupola is used to preheat the air.

Pre-heat the cupola air supply and get hotter iron and reduced coke consumption! With a Whiting Hot Blast System you obtain a higher melt temperature which produces hot, fluid metal . . . a higher percentage of good castings with close, even grain . . . closer metallurgical control of the melt and an hourly melting rate increase of as much as 15%. Since proportionately less coke is used the sulphur pickup decreases and the faster melting rate means less oxidation. This permits you to use more *scrap* iron—less *pig* iron!

You have a choice of two Whiting Systems to pre-heat the air. The Todd-Thermo externally fired heater is a compact, high efficiency unit employing a single burner. The Griffin system, a recuperative method, uses partially burned gases from the stack. Each method has certain advantages for particular situations, and a Whiting foundry engineer will help you choose the system that is best for your requirements.

WHITING CORPORATION
15628 Lathrop Avenue, Harvey, Illinois

Write today!
Ask for Bulletin FO-3. It gives complete information on the advantages of hot blast.